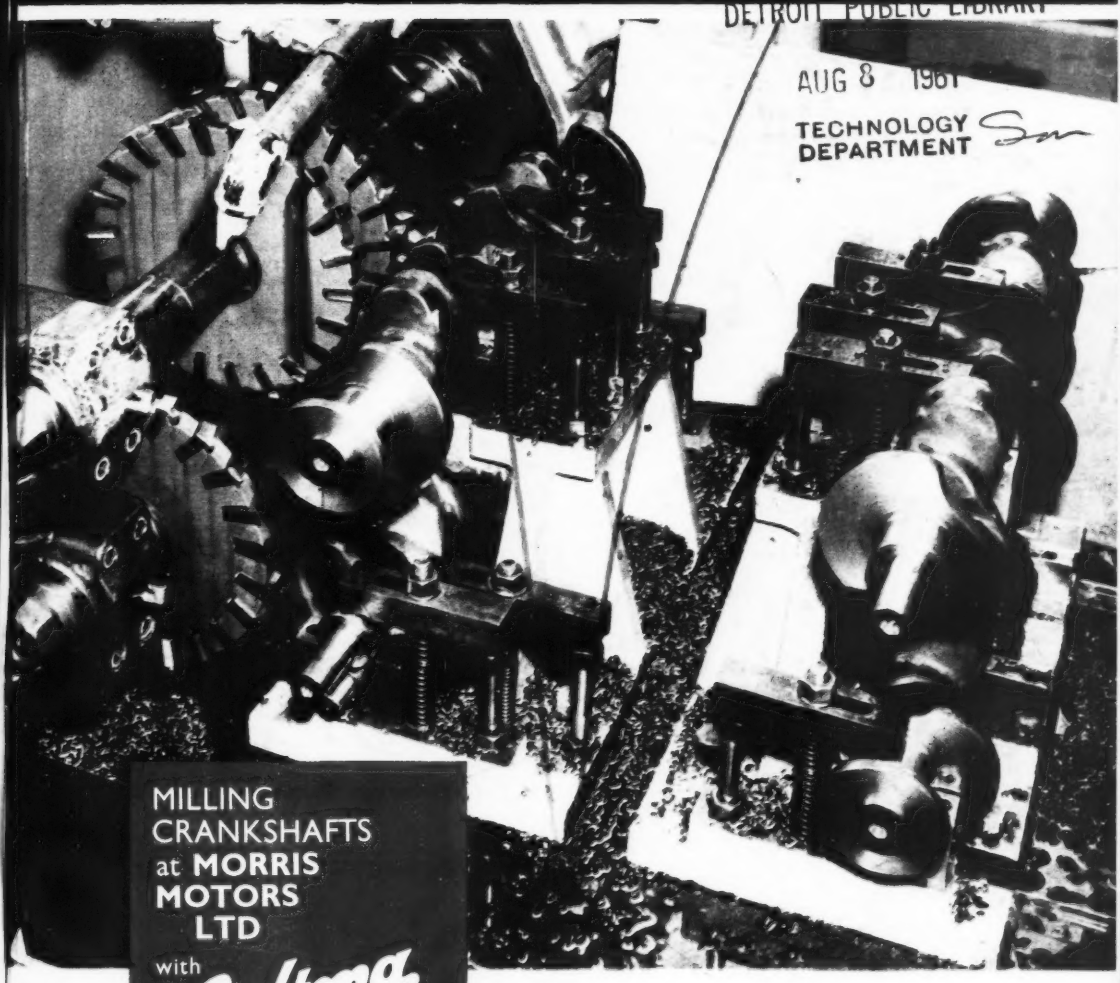
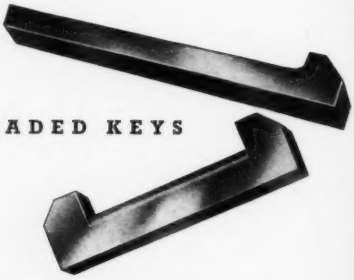
MACHINERY

JULY 19, 1961 ONE SHILLING & THREEPENCE

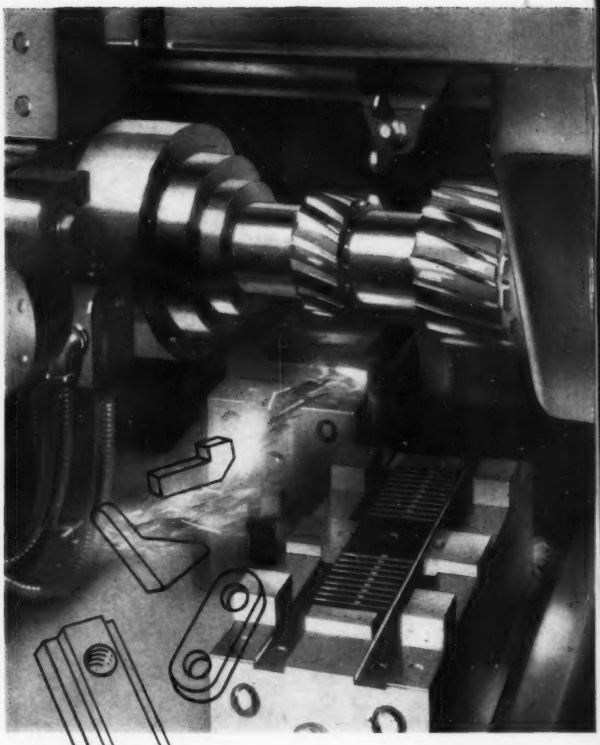


WOODRUFF KEYS



HEADED KEYS

PLAIN KEYS



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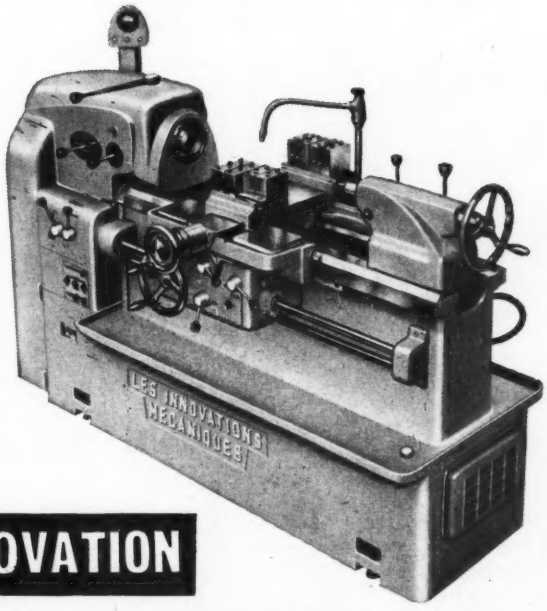
MILLS KEYS are used in all branches of the engineering industry.
The high quality of their workmanship and the low prices have created such a heavy demand that standard types in carbon steels are now always in stock. Special materials, finishes, machining features or heat treatment can be supplied at short notice and there is a large capacity for "specials" to customers own drawings.

Our technical services are available to advise you on the physical properties, design and any other problem connected with Keys or similar components.

EXORS OF JAMES MILLS LTD

July

FOR REALLY *RAPID* PRODUCTION...



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MULTI-TOOL PRODUCTION LATHES

Exceedingly robust and powerful. Unusually efficient drive provides extra power *at the spindle*. Manufactured to the highest standard of accuracy and interchangeability with the most modern equipment. Hardened and ground steel slideways. The bed and base form an integral unit. The spindle runs on three precision Gamet bearings. The tailstock is exceedingly robust and the carriage and cross-slide are of ample proportions, permitting multiple tooling both front and rear. Longitudinal traverse controlled by micrometer stops. Quick action stops for both front and back tools. Can be equipped with air-operated chuck and tailstock. Numerous items of equipment to aid production.

See Model T5 at our Showrooms

	T5	T6
Swing over bed	***13¾″***	***17½″***
Centre distance	***21½″***	***27½″***
Spindle revs.	***180 to 2800***	***45 to 2000***

Send for illustrated brochure M/240 from the Sole U.K. Distributors:

DOWDING & DOLL LTD

346 KENSINGTON HIGH STREET, LONDON, W.14

Tel: WESTERN 8077 (8 lines) *Telex:* 23182 *Grams:* ACCURATOOL LONDON TELEX

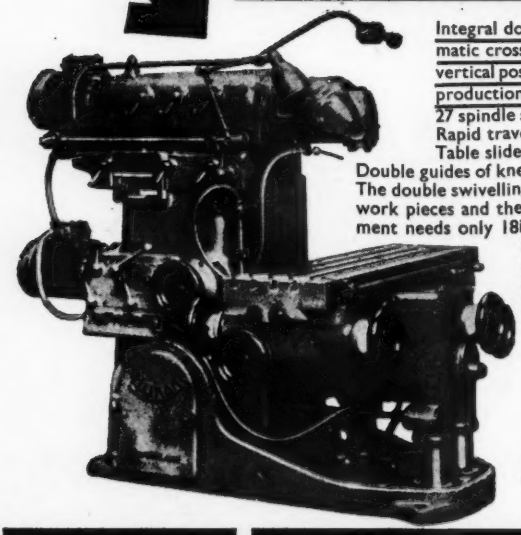
240

SLIDING RAM GIVES 27½in. AUTO CROSS FEED

HEAVY DUTY MILLING

ANGULAR COMPOUND HORIZONTAL VERTICAL

HURON SUPER UNIVERSAL MILLERS



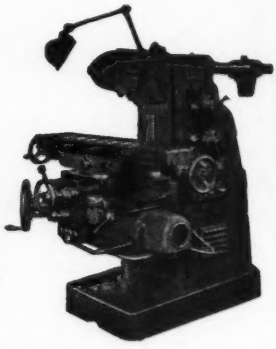
Integral double swivelling universal head provided with 27½in. automatic cross feed by the sliding ram, can be set to the horizontal or vertical position, or to any angle instantaneously—permits the heaviest production cuts. Heads can be retracted completely from table line. 27 spindle speeds from 30 to 2,066 r.p.m., 27 feeds from $\frac{1}{16}$in. to 30in. Rapid traverses in all directions. All operating controls duplicated. Table slides directly in the knee without cross movement or swivel. Double guides of knee permit components in excess of 1½ tons to be machined. The double swivelling universal head requires an opening of only 14in. to enter work pieces and the whole sliding ram with its 27½in. automatic cross movement needs only 18in. clearance. OPTIONAL EXTRA FEATURES: Mounted spacing casting assemblies providing additional 8in. capacity under spindle. 26in. wide 8 T-slot tables and 39⅜in. automatic cross feed of sliding ram with special heavy duty knee and front operating position.

Type	Table	Automatic Feeds Long	Cross	Vert.
KU4	56$\frac{3}{16}$in. × 15$\frac{3}{16}$in.	43½in.	27½in.	19$\frac{3}{16}$in.
KU5	64$\frac{3}{16}$in. × 15$\frac{3}{16}$in.	51½in.	27½in.	19$\frac{3}{16}$in.
KU6	78$\frac{3}{16}$in. × 16$\frac{3}{16}$in.	59in.	27½in.	19$\frac{3}{16}$in.
KU55	64$\frac{3}{16}$in. × 26in.	51½in.	38$\frac{3}{16}$in.	18$\frac{3}{16}$in.
L83	157in. × 59in.	118in.	39$\frac{3}{16}$in.	59in.

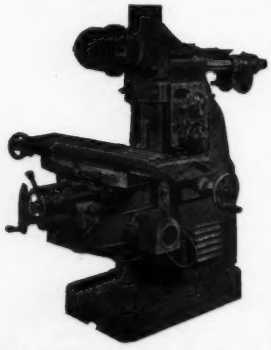
Type 'L' Open-side Traversing Head Universal Miller will mill, bore, slot and drill the largest work-pieces at one setting. The unique design permits greatest variety of operation on large work-pieces; the component remains stationary on the large work-table. Upright slides full length of base table and the sliding ram moves vertically and horizontally.

DUFOUR UNIVERSAL MILLERS

WITH DOUBLE UNIVERSAL SWIVELLING HEAD, RETRACTABLE SLIDE BRACKET AND SPACING CASTING GIVING 26" DAYLIGHT ON No. 59 AND 21" ON No. 61



FOR ALL MODELS Direct reading dial change for speeds and feeds. All parts subject to wear hardened and ground and completely interchangeable. Built to closest tolerances. Rapid traverses in all directions. Table swivels 30°. No. 40 taper for main horizontal spindle, double swivelling universal head, dividing head and rotary table. Hardened and ground centre guide for slideways. Twin overarms. Double swivelling sliding spindle heads with speeds 53-3000 r.p.m. Double swivelling universal head on retractable slide bracket providing with 5½in. Spacing Casting Drive assembly on 59 Machine 26in. daylight, and 21in. on No. 61.



MODELS 53 & 61. 16 universal head spindle speeds. 21-1600 r.p.m.; 8 horizontal spindle speeds 21-1180 r.p.m.; 8 automatic feeds ½-18½in.

MODEL 59. 36 universal head spindle speeds 14-1780 r.p.m.; 12 horizontal spindle speeds 21-1180 r.p.m.; 16 automatic feeds ⅜-20in.

MODEL 54. Automatic cross feed of universal head 20in.; 18 universal head spindle speeds 12-1500 r.p.m.; 36 horizontal spindle speeds 6-1500 r.p.m.; 18 automatic feeds $\frac{1}{16}$-23⅜in.

Type	Table	Automatic Feeds Long.	Cross	Vert.
53	43½in. × 9½in.	27½in.	9½in.	15½in.
61	47½in. × 10½in.	30½in.	9½in.	15½in.
59	51$\frac{3}{16}$in. × 11½in.	34½in.	11$\frac{13}{16}$in.	21$\frac{1}{16}$in.
54	67in. × 14½in.	43½in.	14½in.	20½in.

Send for full particulars of our very extensive range of these machines; ask for demonstration.

Rudolph Carne & Co. Ltd. SWAN WORKS, FISHERS LANE, CHISWICK, LONDON, W.4.

Telephone: CHISWICK 0514 & 6585. Inland Telegrams: RUDCAR, CHISK, LONDON. Overseas Telegrams: RUDCAR, LONDON.

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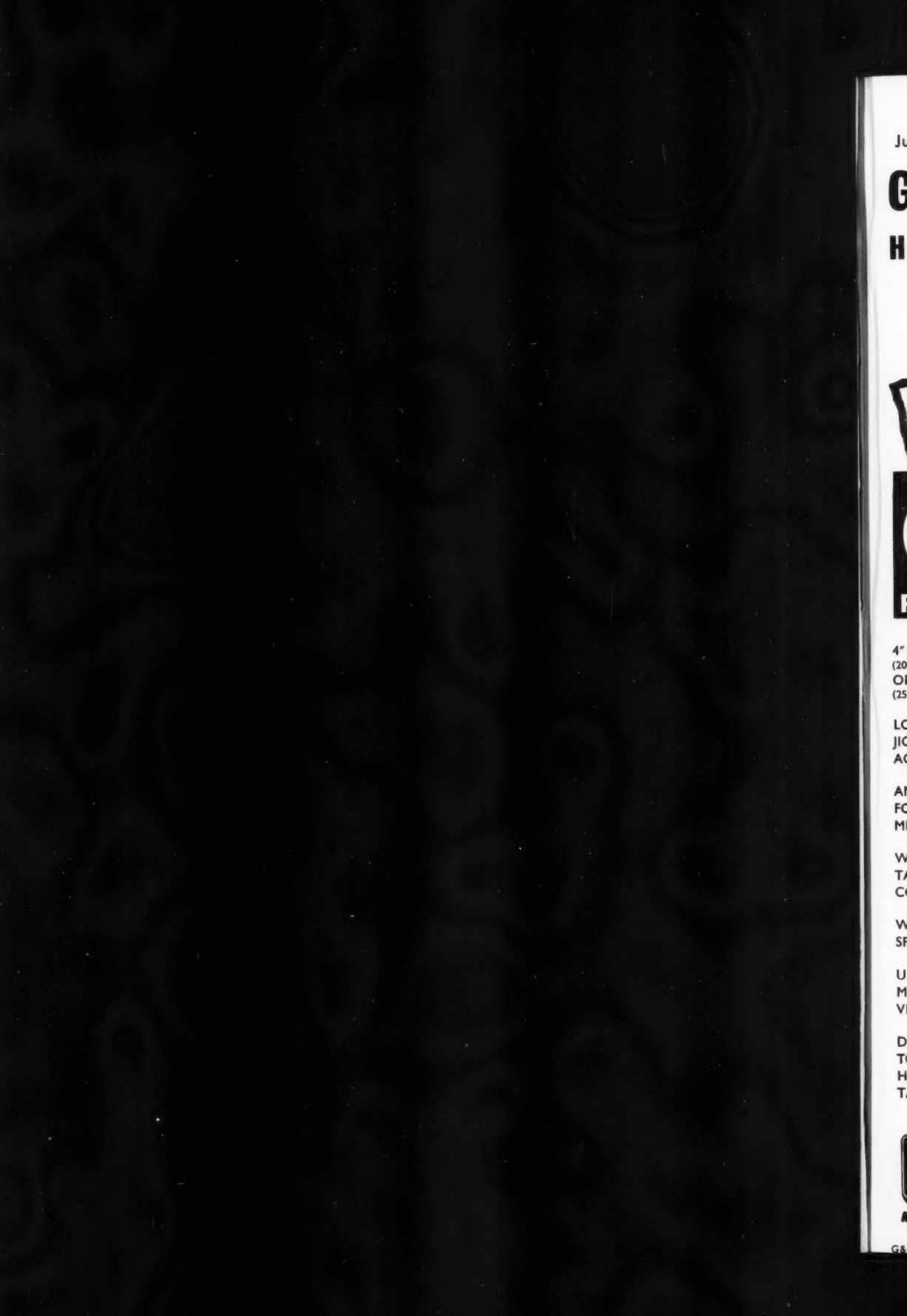

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Close tolerances required in Milling, Boring, Drilling and Tapping 'U.S.' MULTI-SLIDE Beds are maintained on Model 350-T machine at ALLTOOLS LTD., Brentford.

4" DIA. SPINDLE
(20 H.P. MOTOR)
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LONG LASTING JIG BORING ACCURACY

AMPLE POWER FOR HEAVY DUTY MILLING

WIDE CHOICE OF TABLE, BED AND COLUMN SIZES

WIDE RANGE OF SPEEDS AND FEEDS

UNEQUALLED MACHINING VERSATILITY

DIRECT READINGS TO 0·001" OF HEADSTOCK AND TABLE SETTINGS

BRIEF SPECIFICATIONS

Model	340-T	350-T
Diameter of spindle	4"	5"
Spindle motor	20 h.p.	25 h.p.
Spindle speeds (45)	10-1300 r.p.m.	7·5-975 r.p.m.
Max. table cross travel	132"	132"

EQUIPMENT AVAILABLE includes
EXTENDED SADDLE AND SADDLE SUPPORTS with in- or over-the-floor type auxiliary runways.
IMPROVED MEASURING DEVICE giving readings to 0·0001".
AUTOMATIC ELECTRIC POSITIONING—positive settings within 0·0002".
HEAVY DUTY ANGULAR MILLING ATTACHMENTS.
CONTINUOUS FEED FACING AND BORING HEADS.
Many types of AUXILIARY and BUILT-IN ROTARY TABLES.
DAVIS SUPER MICROMETER STUB BORING TOOL SETS.

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MODEL SE16

INDEPENDENT CROSS & LONGITUDINAL TOOL CARRIERS FOR EACH SPINDLE

Designed for the high speed production of small components.

Spindle speeds up to 5000 rpm; piece times as short as 2 secs.

Individually positioned quills carry longitudinal tools.

Full accessibility for setting.

Easy swarf clearance without stopping machine.

Large number of special attachments.

Components can be machined on part-off side with pick-off attachment.

Heavy construction—net weight 4¼ tons.

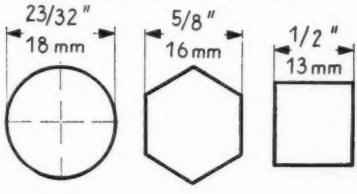
Fully automatic lubrication.

Automatic safety devices.

EARLY DELIVERY

Maximum Bar Feed	4¼"
No. of Spindle Speeds	45
Range of Spindle Speeds	400 – 5000 rpm
Piece Times	2 – 45 secs.

MAXIMUM CAPACITIES



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EQUIPMENT

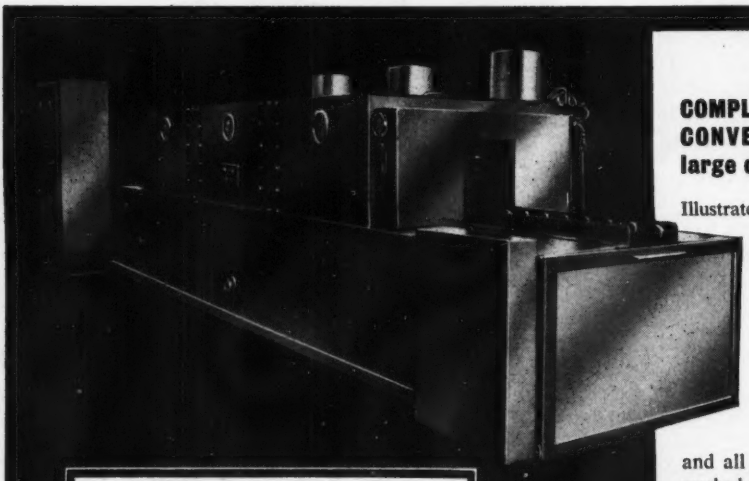
for WASHING and DE-GREASING MACHINED PARTS

with speed and economy

DESIGN and CAPACITY to suit your exact requirements, whether components are large or small.

HAND or AUTOMATIC sprays using paraffin, white spirit or an aqueous detergent.

EFFICIENCY/ECONOMY washing fluid is continuously treated by centrifuge or filter, ensuring a constant supply of clean fluid.



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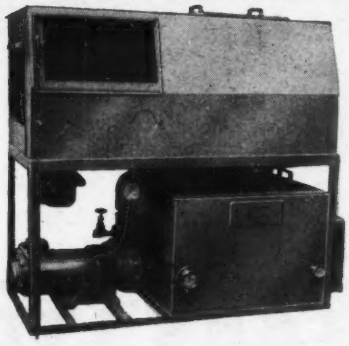
COMPLETELY AUTOMATIC CONVEYOR PLANTS for large quantity production

Illustrated on left is a completely automatic conveyor plant recently supplied to a leading British car manufacturer. This equipment has especially been designed for the continuous washing of cylinder blocks, so that valve ports, stud holes and all surfaces are thoroughly washed and dried.



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for smaller quantities or batch work.

Get into touch with

DE LAVAL

for the reclamation and centrifugal treatment of all types of washing fluids, machine shop oils and coolants. Our extensive experience can help to solve your particular problem.

For full details write to:

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ALFA-LAVAL COMPANY LTD.

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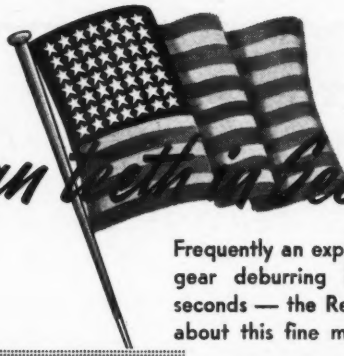
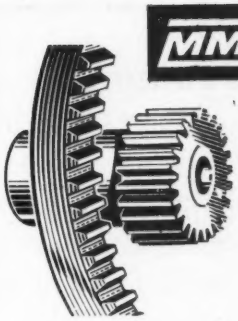


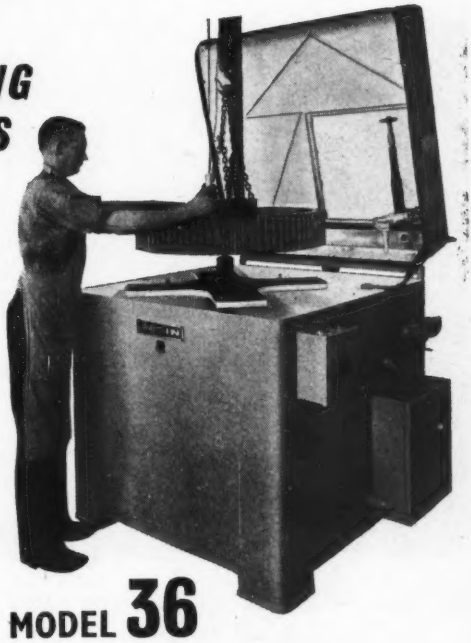
Clean teeth in seconds!



Frequently an expensive hand operation, gear deburring is now a matter of seconds — the Redin way. Learn more about this fine money-saver!

REDIN GEAR DEBURRING MACHINES

MODEL 20



MODEL 36

MODEL 20	
Capacity (External)	
Maximum Pitch Diameter	20"
Maximum Gear Face ...	6"

MODEL 36	
Capacity (External)	
Maximum Pitch Diameter	36"
Maximum Gear Face ...	12"

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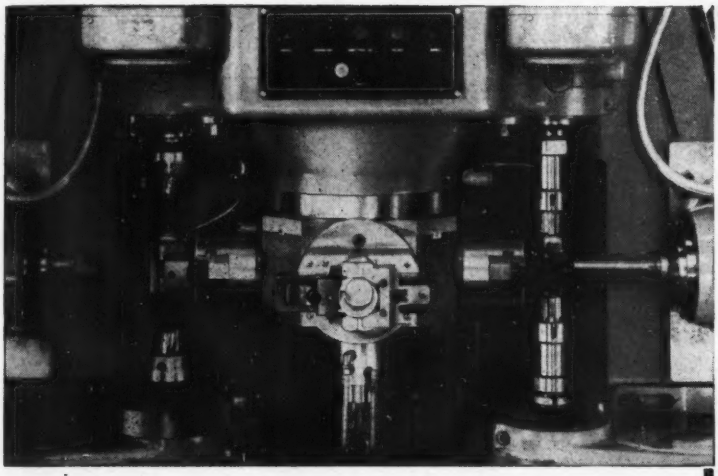

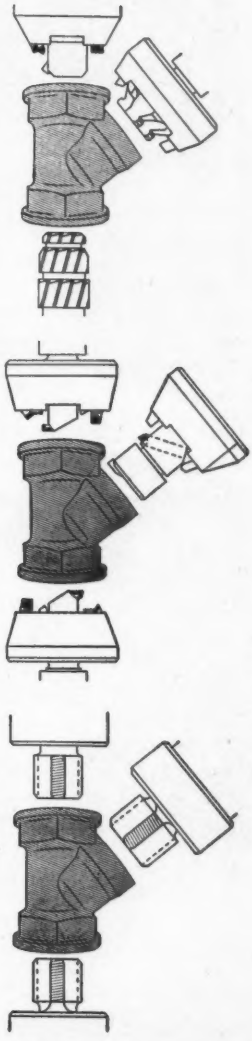

Diedesheim fully Automatic multi-unit machine

for the production of pipe fittings, valve and cock bodies

and similar components

MODEL AMI WITH 9 UNITS

MODEL AMII WITH 12 UNITS

- Suitable for drilling — boring — facing — threading — sawing — milling — multi-spindle drilling & tapping, etc.
- Simultaneous machining — from three directions — at each station.
- Capacity for ⅛″ to 2″ nominal size pipe fittings
- Spindle speeds to suit all materials
- Infinitely variable feed to each unit
- Foolproof reloading during cutting cycle
- Hydraulic chucking with auto-release
- Rapid change-over to different components
- Three or four working stations.

Production times for lateral valve housing illustrated:
¼″ nom. size: 7 secs. 1″ nom. size: 10 secs. 2″ nom. size: 18 secs.

Sole British Agents

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Machine Tool Co. Ltd

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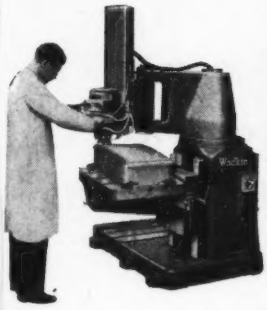
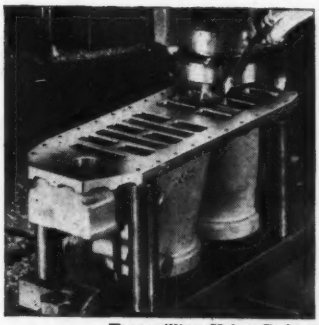
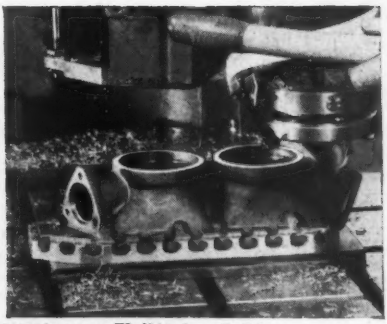


Wadkin Articulated Arm Router L.C.6





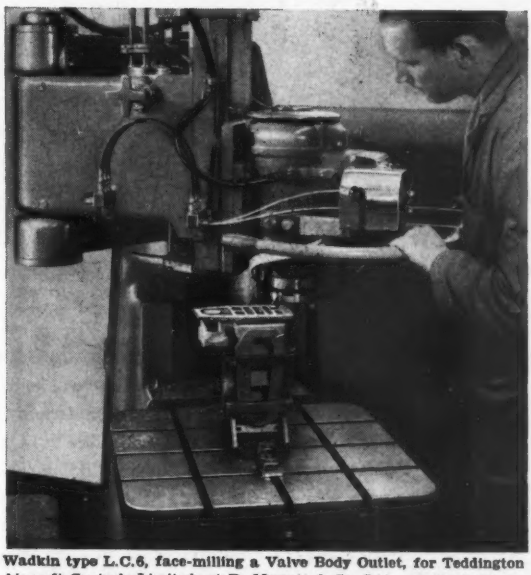
Face-milling Valve Body components on a Wadkin type L.C.6

Wadkin Articulated Arm Router

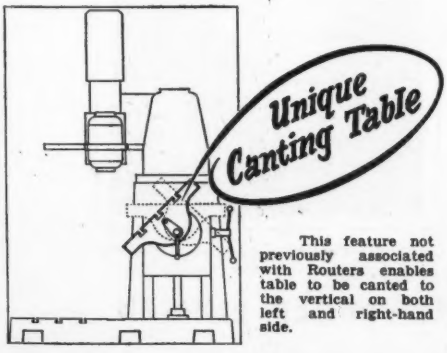
cuts machining times by more than 50%

on light alloy components

D. Merrett & Co. Ltd., Tewkesbury are yet another firm who have taken advantage of the new Wadkin High-speed Milling Techniques.
Their Wadkin Articulated Arm Router, type L.C.6, recently installed to meet rising production costs, has cut machining times by more than one half! Type L.C.6 is a relatively inexpensive, medium capacity machine with cutting speeds up to 18,000 r.p.m. It has power rise and fall to the head, integral base plate, and rising and falling canting table. Details of the L.C.6 and the Heavy Duty Machine, type L.C. with either 6ft. 0in. or 8ft. 0in. reach are given in Leaflet 945. May we send you a copy?



Wadkin type L.C.6, face-milling a Valve Body Outlet, for Teddington Aircraft Controls Limited, at D. Merrett & Co. Ltd., of Tewkesbury.



This feature not previously associated with Routers enables table to be canted to the vertical on both left and right-hand side.

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HIGH SPEED MACHINE TOOLS

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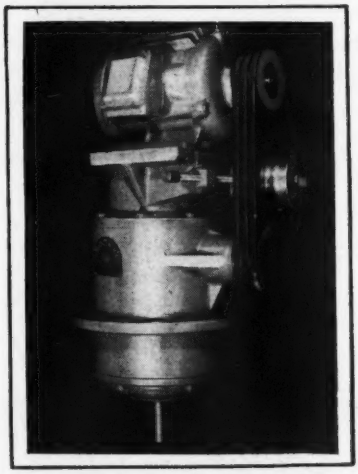
Dress in "Crimplene" made from 100% Terylene. By Courtesy of I.C.I. Limited.

Sanderson's Heliocentric Speed Reducing Gears have been chosen by Imperial Chemical Industries Limited to play an important part in the production of 'Terylene' polyester fibre. Gears are installed in I.C.I. plants producing 'Terylene' in Great Britain, and in the many plants manufacturing polyester fibre under licence throughout the world.

Heliocentric may be the answer to your power transmission problems—range of ratios 20:1 to 512,000:1. Horse power 1/6 to 30.

Please write for illustrated brochure to Department H.G.



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SANDERSON BROTHERS AND NEWBOULD LIMITED

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For you TaperFast means an immediate reduction in your drilling expenditure. For every size of Jobber Drill you use from $\frac{1}{8}$in.—$\frac{1}{2}$in., A—Z or 1—31, you can now use a Tapershank Drill, but it will cost you no more than you are now paying for your Jobbers. This means that you can have Tapershank performance at Jobber's price.

If you want to know more about this new advance in drilling technique, all you have to do is to write or phone your nearest Clarkson Service Centre.

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* ***EXCLUSIVE TO CINCINNATI...***
AUTOMATIC GRINDING WHEEL BALANCING

—provides simple (single lever), fast (20 seconds) and precise balancing whenever required.

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"FILMATIC" GRINDING WHEEL SPINDLE BEARINGS

—require no maintenance, repair or replacement during lifetime of machine.

- Control station at both front and rear.
- No obstruction between operator and between-wheels working area at rear operating position.
- Plain or ball type regulating wheel slides.
- Infinitely variable regulating wheel speeds.
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- Micrometer-type infeed handwheels graduated in 0.00005"
- Centrally grouped controls for ease of operation and maximum efficiency.

Write now for full specification—Catalogue G-747-E

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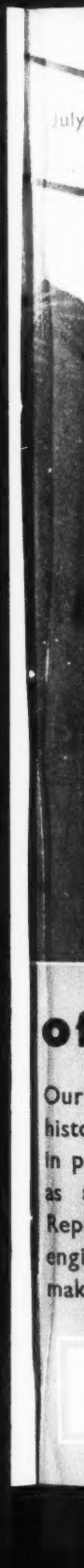
Announcing a new machine incorporating features to reduce operating costs through higher production, increased accuracy and greater ease of operation

220-8 Centuramic GRINDER

Max. work dia — $4\frac{3}{4}$″
Grinding Wheel —
size—8″ wide (max)
x 20″ dia. (max)
drive—20 h.p.

Recessed bed permits operator to stand *close* to machine for maximum working convenience.

CINCINNATI MILLING MACHINE CO.
BIRMINGHAM 24



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VISIT OUR STAND No. 7404 • 7th EUROPEAN MACHINE TOOL EXHIBITION BRUSSELS—SEPTEMBER 3-12, 1961

This new system is perfection in tool holding. The tool is carried in a non-stick taper in the spindle nose and secured by a draw bar via a bayonet type attachment. The quick lock and hydraulic release are operated from a switch.

tool changing in seconds!

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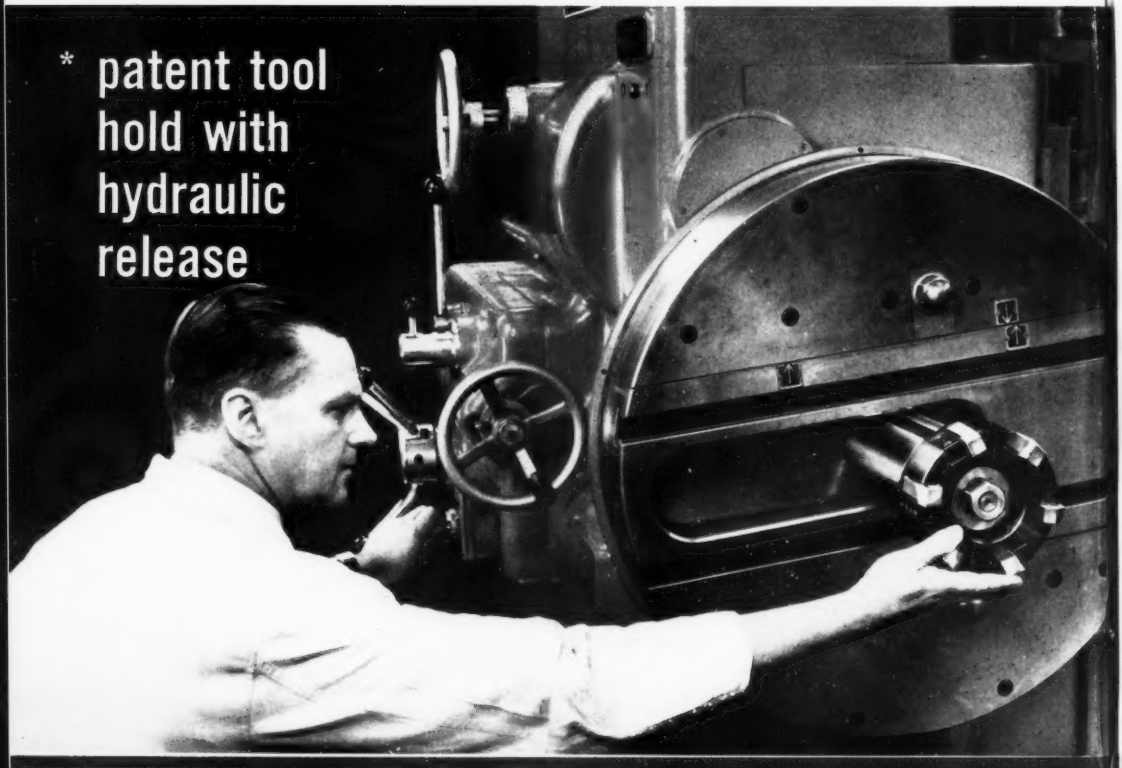
* Eliminates damage and wear.
* Simple to operate.
* Reliable in performance.
* Available on Series 45, 72 and all Kearns Patent Horizontal Boring Machines.

KEARNS



* Another KEARNS development for improved production efficiency

H. W. KEARNS & CO. LIMITED, BROADHEATH near MANCHESTER

WE ARE EXHIBITING AT THE 7th EUROPEAN MACHINE TOOL EXHIBITION
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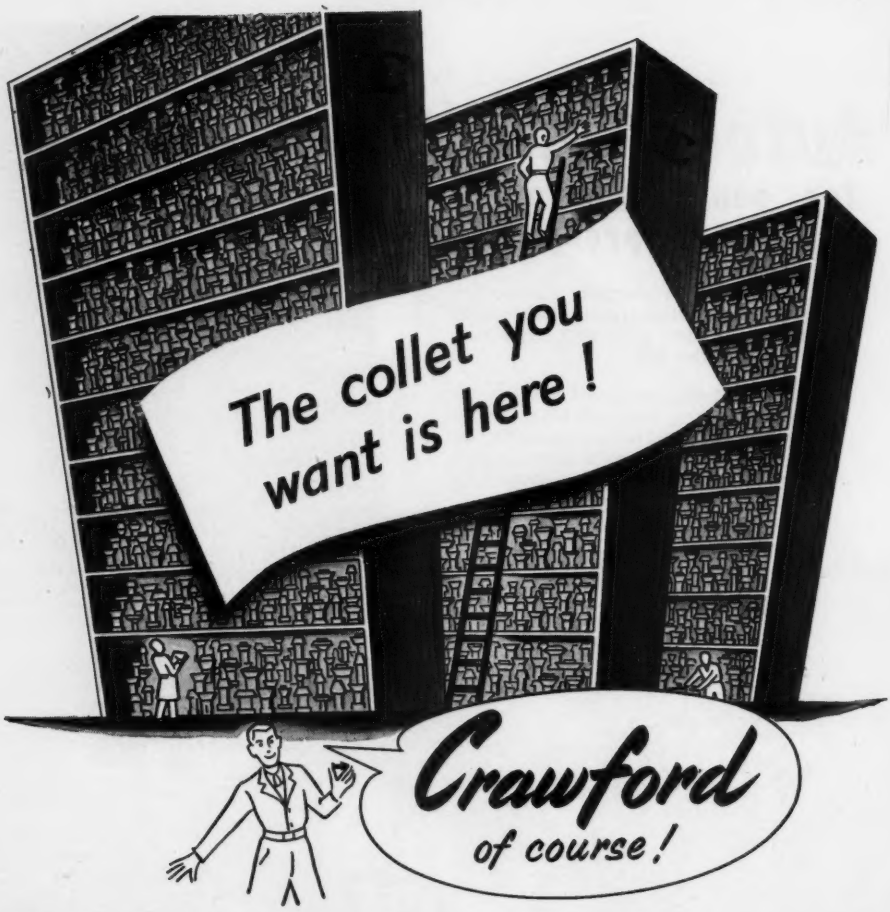

All standard types in stock

. . for precision lathes, watchmakers lathes, milling machines, drilling machines, etc. Crawfords, specialists in collets for more than sixty years, can supply collets of every size and shape, all standard types being held in stock—and specials can always be made to your specifications. Write now for further details.

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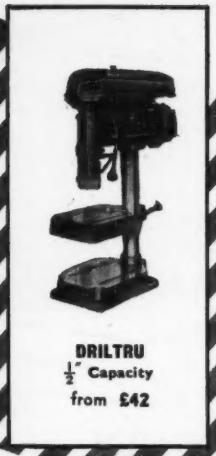
When answering advertisements kindly mention MACHINERY.

61


July

MEDDINGS Pacera

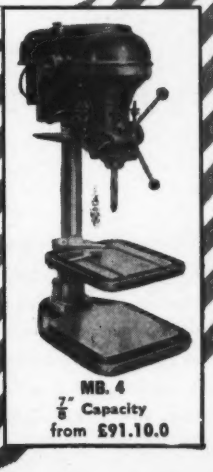
For drilling machines plus complete tooling service



DRILTRU
½" Capacity
from £42

LB. 1 MK II
½" Capacity
from £56.15.0

MB. 2 MK II
⅝" Capacity
from £66

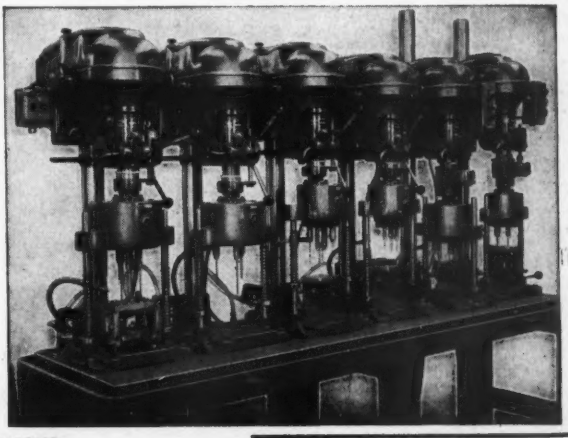


MB. 4
⅞" Capacity
from £91.10.0

Four very popular models are illustrated. We also make a full range of pedestal, multi-head, wall mounting and articulating head machines with throat depths up to 24".

A COMPLETELY TOOLED SET-UP FOR *YOUR* PRODUCTION LINE

Have you investigated the possibility of using time-saving multi-spindle or multi-head methods on your components? We can supply anything from a simple 2-spindle attachment to a complete drill, ream, counterbore and tap sequence. Jigs and fixtures too, of course.



Write for full details to the Makers:

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Tel: Slough 26761

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6103, Hall 6
7th European Machine Tools Exhibition, Brussels, September 3—12

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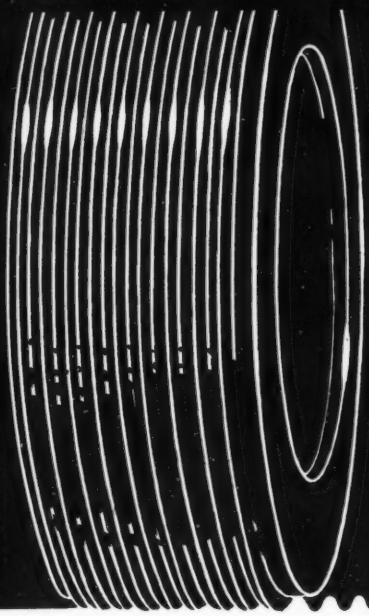
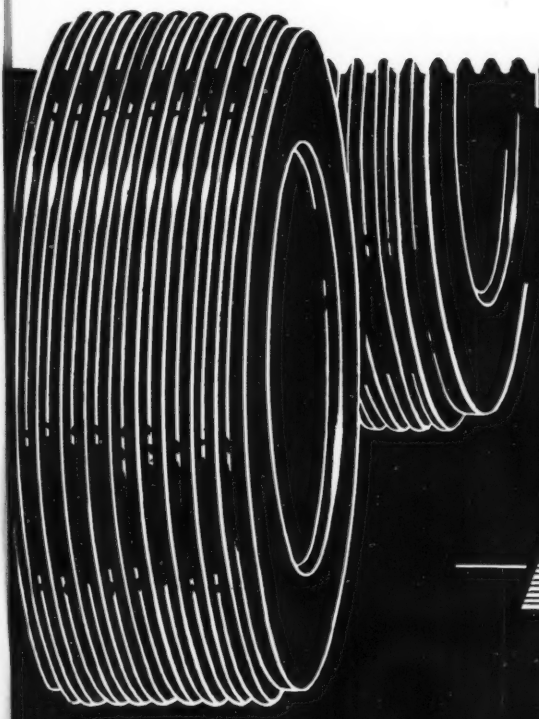


— fit your thread-rolling heads

Herbert Ground-Thread Rolls for thread rolling die-heads have achieved a high reputation for precision and durability combined with high rates of production.

with HERBERT ground-thread rolls



These rolls are made in the same works and under the same conditions as Coventry Die-heads and Dies and Herbert-Ground Thread Taps which are world-renowned for quality and accuracy.

Large stocks of rolls, covering all the most generally-used standard thread forms and sizes up to $1\frac{1}{4}$" diameter, are maintained.

Full details and prices are obtainable from our Threading Dept., Head Works.

We also manufacture circular and flat thread-rolling Dies to suit all leading makes of machines.

ALFRED HERBERT LTD., COVENTRY

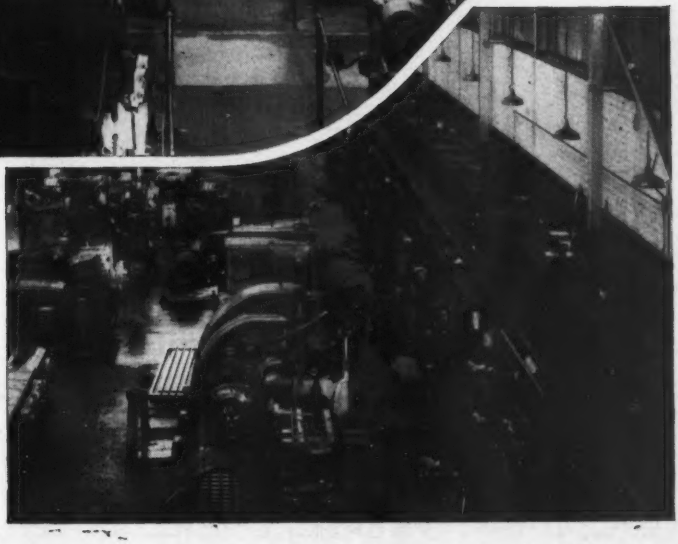
AD522

Forty years' experience in rebuilding machine tools enables us to handle any normal machine and also the more specialised machines such as Pratt & Witney Kellers, De Vlieg Jigmils, Fellows Gear Shapers, Heald Borematics and Internal Grinders.

HERBERT REBUILT MACHINE TOOLS

A "Herbert Rebuilt" machine is as accurate as new and is once more an efficient unit which will continue in production for many more years.
A visit to our Rebuilding Department to see the efficient mechanical and electrical facilities available will be of interest.

A section of the department where the rebuilding is carried out on a wide range of machines.



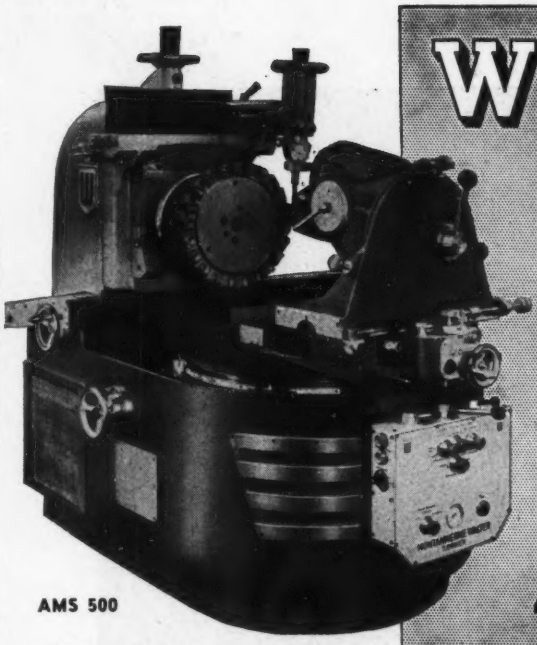
ALFRED HERBERT LTD., COVENTRY Factored Division, Red Lane Works.

AD500

WALTER

AUTOMATIC

Cutter Head Grinders



AMS 500

★ **Fully Automatic Hydraulic Cutter Head Grinders.**

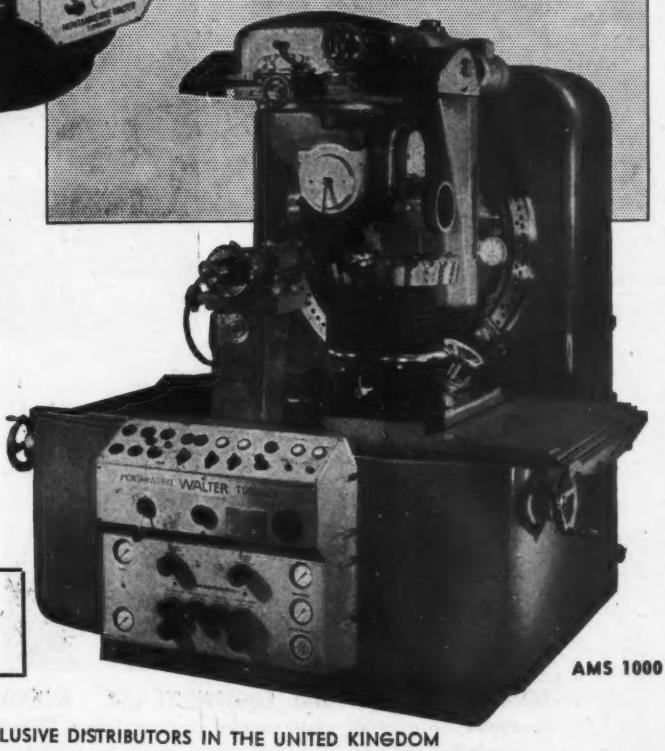
★ **Face and periphery of blades with connecting radius, ground in one continuous operation.**

★ **Automatic Grinding of staggered tooth cutters.**

★ **Suitable for carbide or high speed steel cutters.**

Model AMS 1000.
Capacity cutter diameter 4 - 40".

Model AMS 500
Capacity cutter diameter 3½-20"
EX STOCK



AMS 1000

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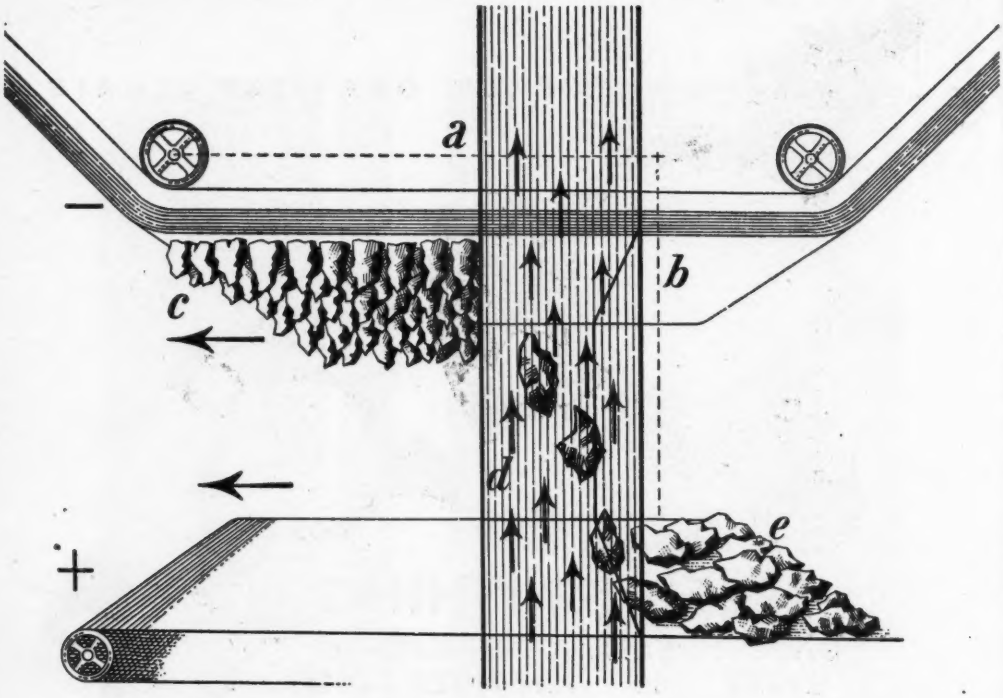

a cut above the rest?

YES a million cuts! And here's why

Every razor-edged grain in EAC abrasives stands bolt upright, presenting maximum cutting power to the work in hand. The grit, orientated on its longitudinal axis, is shot arrow-like into the adhesive by electrostatic force. That's why EAC abrasives literally bristle with cutting edges, work faster and last longer than ordinary makes. There's the right EAC abrasive for every operation. Insist on EAC for the best of good reasons—it saves money!

"BRITANNIA" EAC ENGLISH ABRASIVES CORPORATION LTD "JOHN BULL"

coated abrasives

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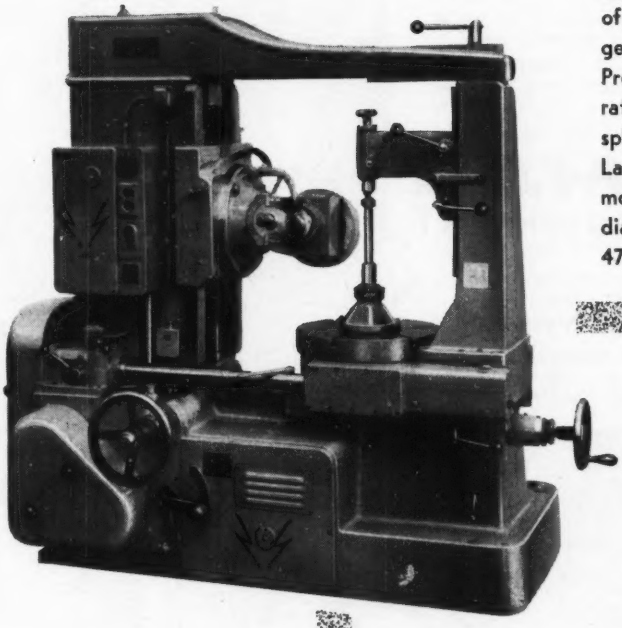

The Almhult KF1 is designed for economic, precision hobbing of single, large or small batch gears.
Produces spurs, helicals, ratchet wheels, worms and splines.
Larger machine available, model KF2, maximum gear diameter that can be hobbed 47".

ÄLMHULT AUTOMATIC GEAR HOBBER KF1

✳ ECONOMIC
✳ ACCURATE
✳ VERSATILE

SPECIFICATION

Max. gear diameter that can be hobbed	23½"
Min. centre distance, cutter spindle-table	1½"
Vertical travel of hob head slide	17 5/16"
Table diameter	19⅝"
Table worm wheel indexing diameter ...	16"

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EXCLUSIVE DISTRIBUTORS OF THE FINEST MACHINE TOOLS

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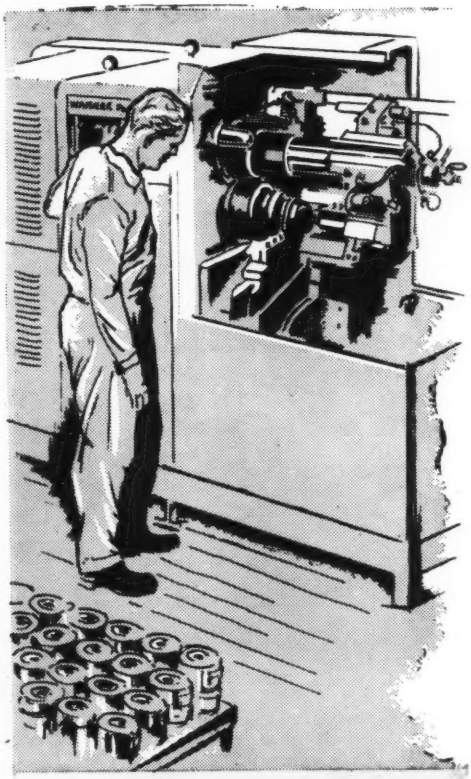


2AC *Automatic*

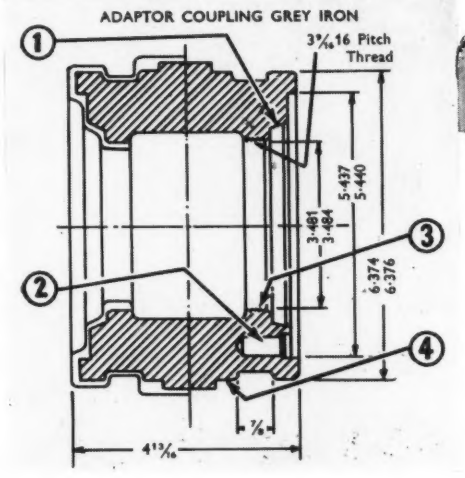
for Versatile Production

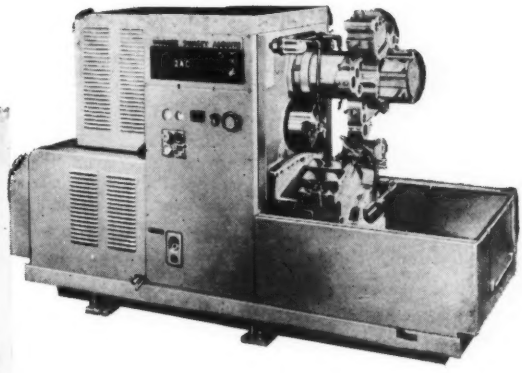
This single spindle chucking automatic is more versatile than a hand-operated machine, it does more complicated work—automatically. You complete more jobs on the 2AC, fewer second operations are needed and standard tool and machine functions will handle most work.

Built-in rigidity and accuracy are features that ensure the holding of close tolerances and speeds and horsepower permit effective use of today's most advanced cutting tools. Because of their fast set-up features batchwork can be produced more profitably on an automatic basis. A 12" air operated chuck is fitted.

The production example below demonstrates:-

1. **Late Cross Slide** - a versatile machine function.
2. **Automatic Feed and Speed Changes** permit multiple drilling the four holes.
3. **Threading Ability** is shown.
4. **The Skip Feed** feature saves cycle time when turning radially interrupted diameters.





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WSA 471
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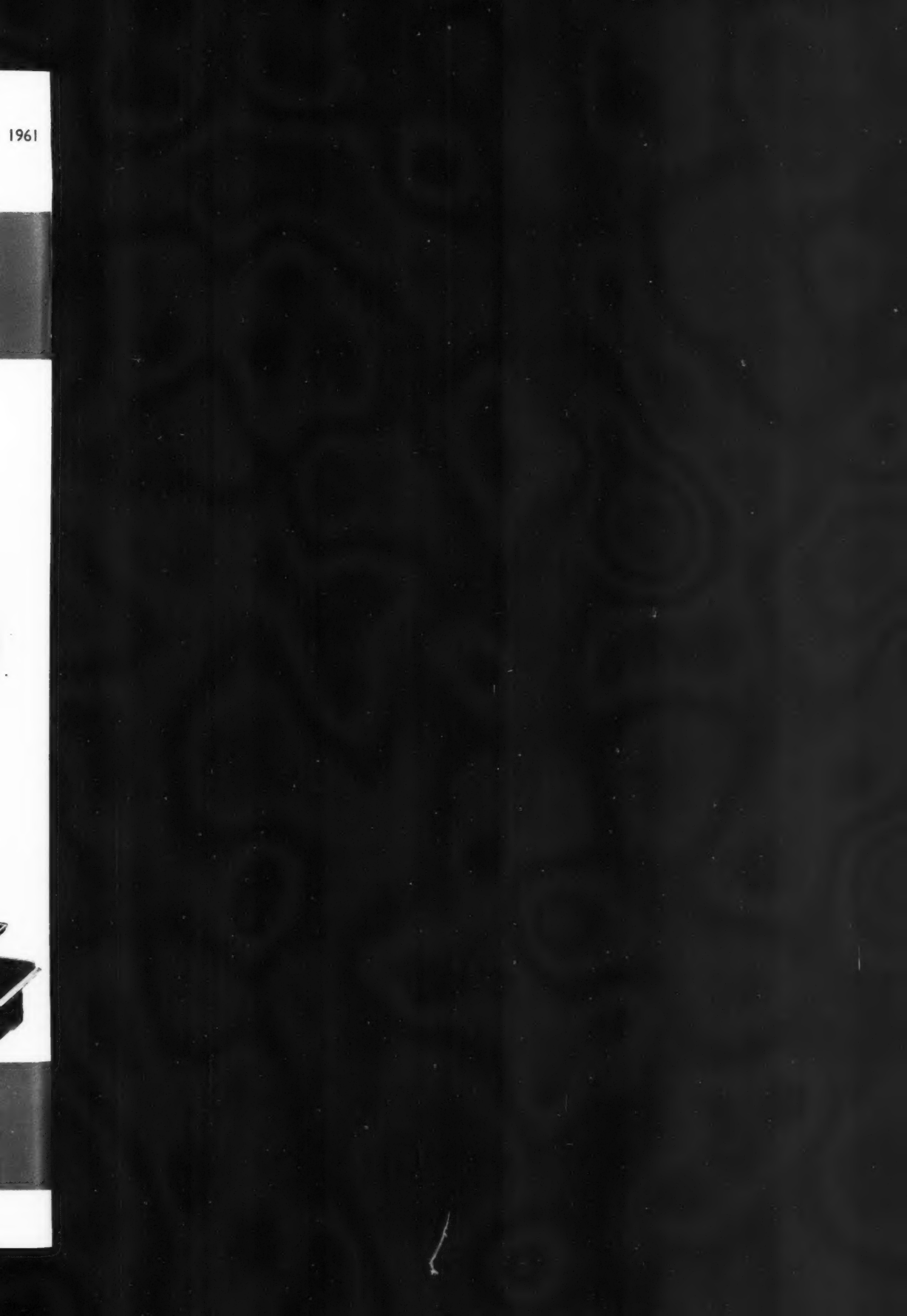
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CAMSHAFT CONTOUR GRINDING MACHINE

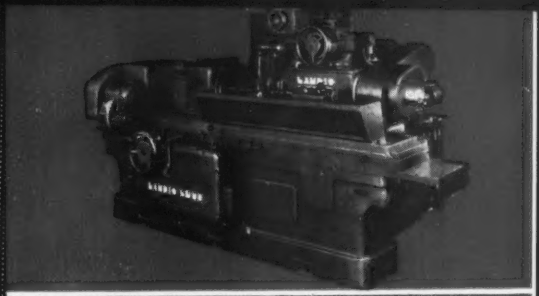
DH 5 x 40

Specially designed for rapid, accurate camshaft, contour grinding.
Automatic cycle includes wheel dressing after each camshaft ground. Available with 26″, 30″ and 40″ work cradle capacity.

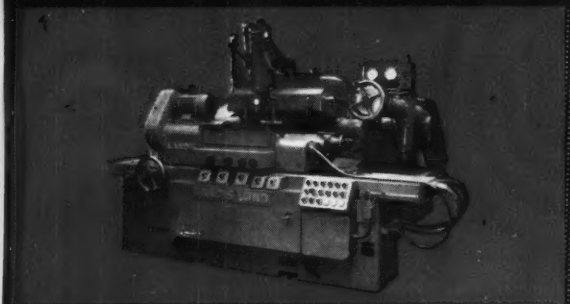
CRANK PIN GRINDING MACHINE

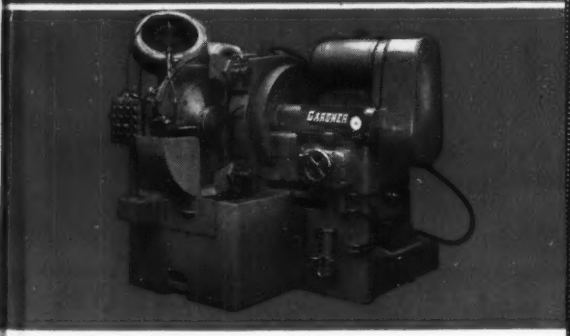
DH 16 x 32 and 42

For automobile, diesel and petrol engines also railway and marine work. Full automatic grinding cycle available. Incorporating **MICROFEED** with dependable full 90° angle profile wheel dressing.



Precision Grinding Machines by LANDIS LUND . . .





MULTIPLE WHEEL GRINDING MACHINE

IWR 10 x 30 and 14 x 30

Equipped to grind multiple diameters on one set-up. A fully automatic grinding cycle can be provided, incorporating **MICROFEED**

DOUBLE SPINDLE DISC GRINDER

2H30 GARDNER

Carries up to 30″ abrasive discs. Available with 20, 25 or 30 HP motors. Can be provided with through feed automatically or manually loaded, or rotary work carrier also automatically or manually loaded. Automatic gauging and wheel dressing available.

AMERICAN DESIGN
BRITISH BUILT

LANDIS LUND LIMITED

CROSSHILLS—KEIGHLEY—YORKSHIRE

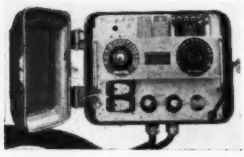
MAC 99

HIGH-SPEED DIE CASTING MACHINE

BRITISH AND FOREIGN PATENTS

- **NEW** 4-way adjustable die unit.
- **NEW** brush device (British and foreign patents) cleans and lubricates die faces, adjustable angle—optional extra.
- **NEW** Automatic cycling—optional extra.
- Push button panel
- Removable spacer plate for centre sprue
- Broader and sturdier base
- Solenoid-operated valve system with speed control
- Exhaust mufflers for quiet operation
- Zinc, Tin, Lead Alloys
- Capacity 12 ozs. Zinc Alloy

ELECTRONIC TIMER UNIT



Optional extra—electronic timer unit entirely enclosed in a metal container. Can be attached instantly to the control panel with quick connect plugs, and be placed away from machine.

NEW BRUSH DEVICE

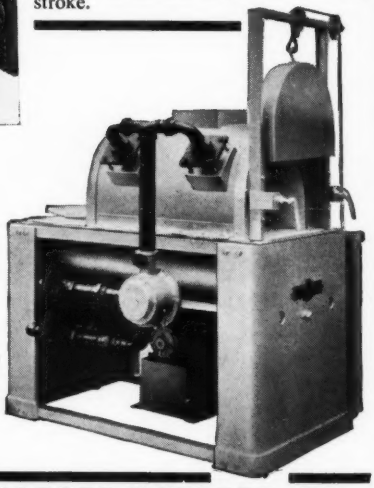
Optional extra—New brush device (British and foreign patents) air operated, cleans and lubricates the die faces. Mounted on a swivel plate to give an adjustable angle to the brush stroke.

DESIGNED ESPECIALLY FOR DIE CASTING PLANTS

AR/200

200lb. REVERBERATORY FURNACE

500lb. Capacity also available



A complete, self-contained unit for aluminium

No crucible. Minimum Heat Radiated. Low maintenance costs Low metal loss. Automatic Atmosphere control and bypass Large cleaning and charging door.

DIE CASTING MACHINE TOOLS LTD.,
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July

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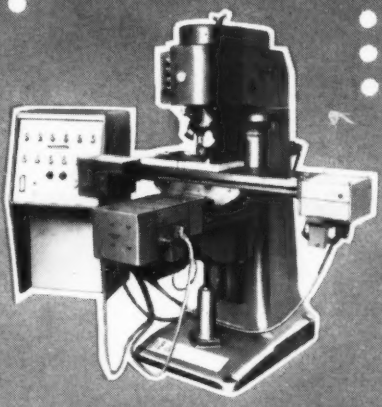
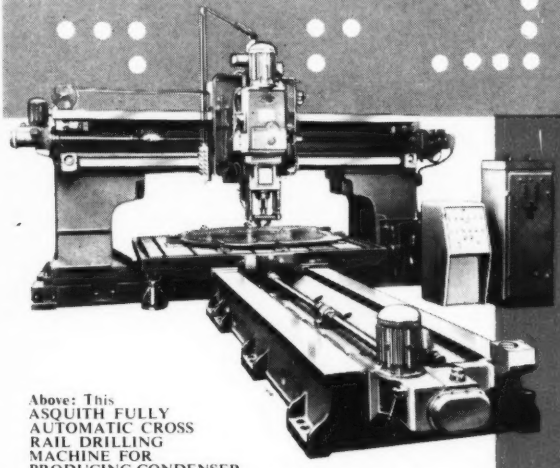
AIRMEC AUTOSET

Gets those Drilling Jobs taped





Above: This ASQUITH FULLY AUTOMATIC CROSS RAIL DRILLING MACHINE FOR PRODUCING CONDENSER TUBE PLATES has a table 14' 6" long · 10' wide. Controlled by the AIRMEC AUTOSET, the overall accuracy of positioning is better than ·005". Manufacturer: William Asquith Ltd., Highroad Well Works, Halifax, Yorks.

Top right: Airmec Autoset fitted to Vero Auto-drill. 6 spindle Turret Head — 36" × 9" table. Spindle speeds 300-6,000 r.p.m. — ⅝" drill capacity.

Full details from: Catmur Machine Tool Corporation Ltd., 103 Lancaster Road, London, W.11.

AUTOMATIC PRECISION DRILLING (LARGE SCALE OR SMALL) WITH THE AIRMEC AUTOSET

POSITIONS THE WORK

AUTOSET automatic co-ordinate setting equipment provides accurate automatic control of the lead screws of a co-ordinate table. It enables the table to be positioned automatically by means of a punched tape (containing co-ordinate information for up to 400 operations) or manually by means of a series of knobs and dials.

SELECTS THE RIGHT TOOL

Facilities are provided for selecting one of up to ten tools and for controlling a large number of other variables such as tool rates, feed depths and spindle speeds.

CUTS OUT ERRORS

Autoset is highly accurate—automatic compensation is provided for table backlash and cumulative lead screw errors.

CUTS THE COST

A complete equipment for automatic control in two dimensions costs only £1,500. Manual control considerably less.

ROBUST AND RELIABLE

No electronic valves used.

EASY MAINTENANCE

Autoset has been designed for trouble-free service and easy maintenance.

Descriptive leaflet No. 186 on request.

Airmec

AUTOSET
Low cost tape control

AIRMEC LIMITED • High Wycombe • Bucks Tel: High Wycombe 2501/7

BROOKE

CARDINAL

CARBIDE "ADJUSTABLE"

REAMERS

HAVE EXCEPTIONALLY LONG LIFE

THEY CAN BE RE-GROUND 5 to 10 TIMES

(according to diameter)

'CARDINAL' TIPS ARE GRADE "B.S.N." (I.S.O.-K20)

Adjustment by coned screw

Carbide Tipped Shell Reamers are manufactured in a range of sizes from 1in. diameter upwards, and the Taper Shank type from ¼in. diameter upwards.

Our full range of standard H.S.S. Reamers is available EX STOCK from

THE BROOKE TOOL MANUFACTURING CO. LTD.

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EWCASTLE-UPON-TYNE	MANCHESTER	BIRMINGHAM 11	LONDON S.W.1.	65 West Regent St.
20419 Telex 53136	Tel. Blackfriars 7012/3	Tel. Victoria 2323	Tel. Abbey 4058	GLASGOW C.2.
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THE LINDNER

Optical measuring system does not depend on lead screws, gauge blocks, bars or limit switches - is permanently protected against mechanical wear. Only a light beam touches helically scribed cylindrical measuring scales which are independent of table movement mechanism and are immovable in axial direction.

Photo-electric optical centring device minimizes visual fatigue and errors in settings - permits initial and repeat settings guaranteed accurate within 0.00015 in. and readings in 0.00005 in. Projection screen eliminates operator eye strain and bending.

AUTOPOSITIONER enables operator to preselect table position for next hole while one boring operation is in progress. As one hole is completed, table moves in rapid traverse to the next preselected position.

Automatic table clamping prevents errors in clamping and unclamping table between movements.
(Available only on Model LB 15 A)

OPTICAL JIG BORER

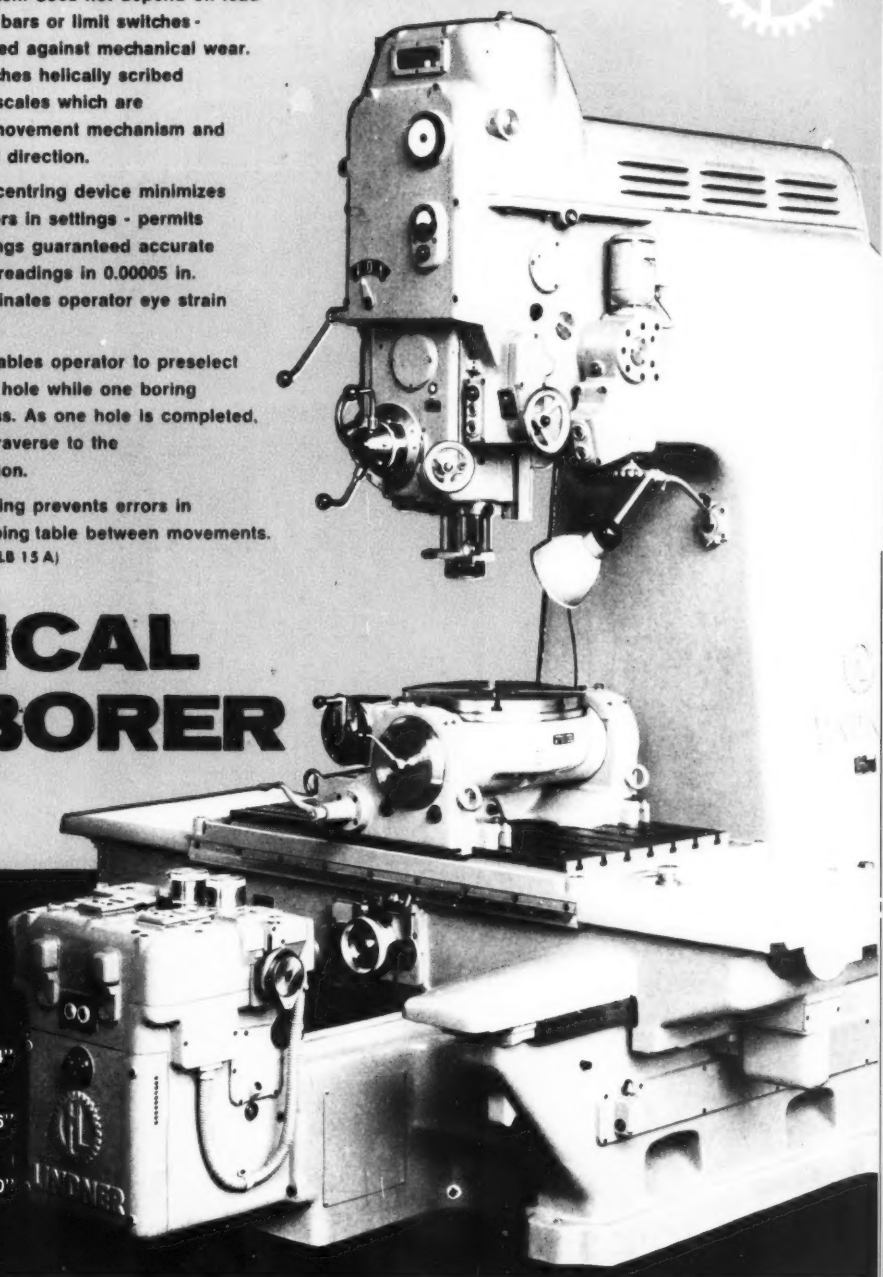


Table sizes:

Model LB 15 A: 44" x 24"

Model LB 14: 32" x 16"

Model LB 12: 20" x 10"

SOLE AGENTS FOR GT. BRITAIN:

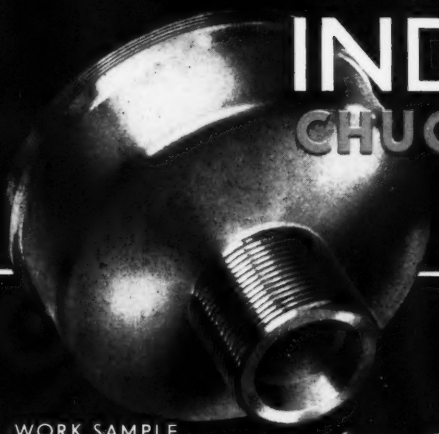
STEDALL MACHINE TOOL CO.

192-204 PENTONVILLE ROA
KINGS CROSS, LONDON, N
Telephone: TERminus 3699 Telegrams: Stedall, London,

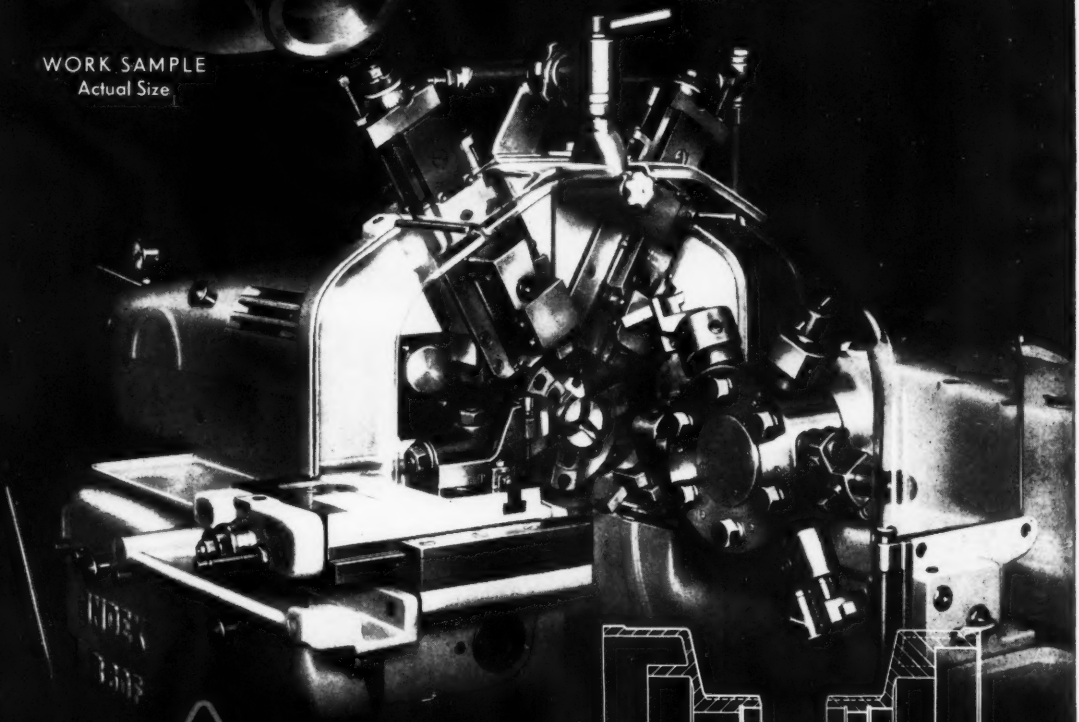
INDEX B 60F
CHUCKING AUTOMATIC

especially suitable for the machining of castings, forgings, pressings and billets.

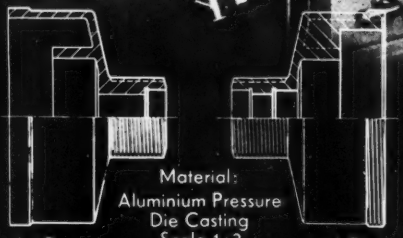
Product of
INDEX-WERKE K.G. HAHN & TESSKY
Esslingen am Neckar · Germany



WORK SAMPLE
Actual Size



PRODUCTION EXAMPLE



Material:
Aluminium Pressure Die Casting
Scale 1:2

1st Op.
150 secs.

2nd Op.
75 secs.

using Thread Chasing Attachment and Spindle Brake Attachment

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Showroom and Spares Dept.: 4-6, Milner Street, LONDON S.W.3., Telephone: KNIghtsbridge 8497/8

Photo by courtesy of Fibres Division, Imperial Chemical Industries Ltd. Manufacturers of 'Terylene' polyester fibre.

C IS FOR CONVEYOR BELTS at a new I.C.I. plant in Cheshire, where eight Goodyear belts of rubber and 'Terylene' carry coke, burnt lime and coke/lime mixture. 'Terylene' was chosen for its flexibility and strength, which allows exceptionally deep troughing so that deck plates, skirt boards, etc., are eliminated and idlers can be spaced 50% wider apart. 'Terylene' also withstands the heat of the coke (carried at up to 120°C), is rotproof and resists moisture penetration. For the *right* conveyor belt, installed in the *right* way and maintained in the *right* manner, contact Goodyear Industrial Products Division at Wolverhampton.

GOODYEAR **THE GREATEST NAME IN RUBBER**

The Goodyear Tyre & Rubber Co. (G.B.) Ltd., Industrial Products Dept., Wolverhampton. Export Enquiries: 17 Stratton Street, London W.1

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ABWOOD

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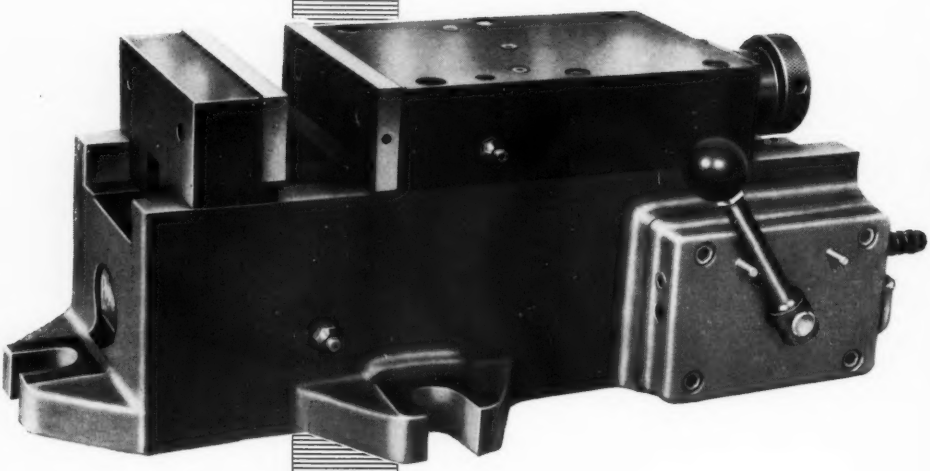

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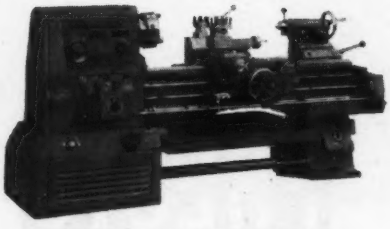

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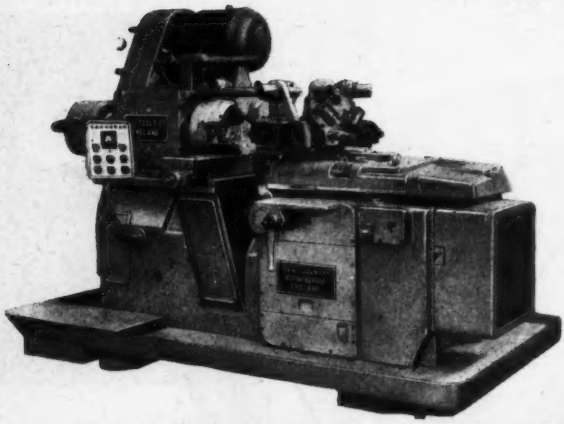

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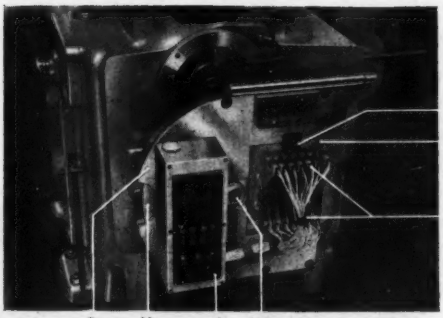

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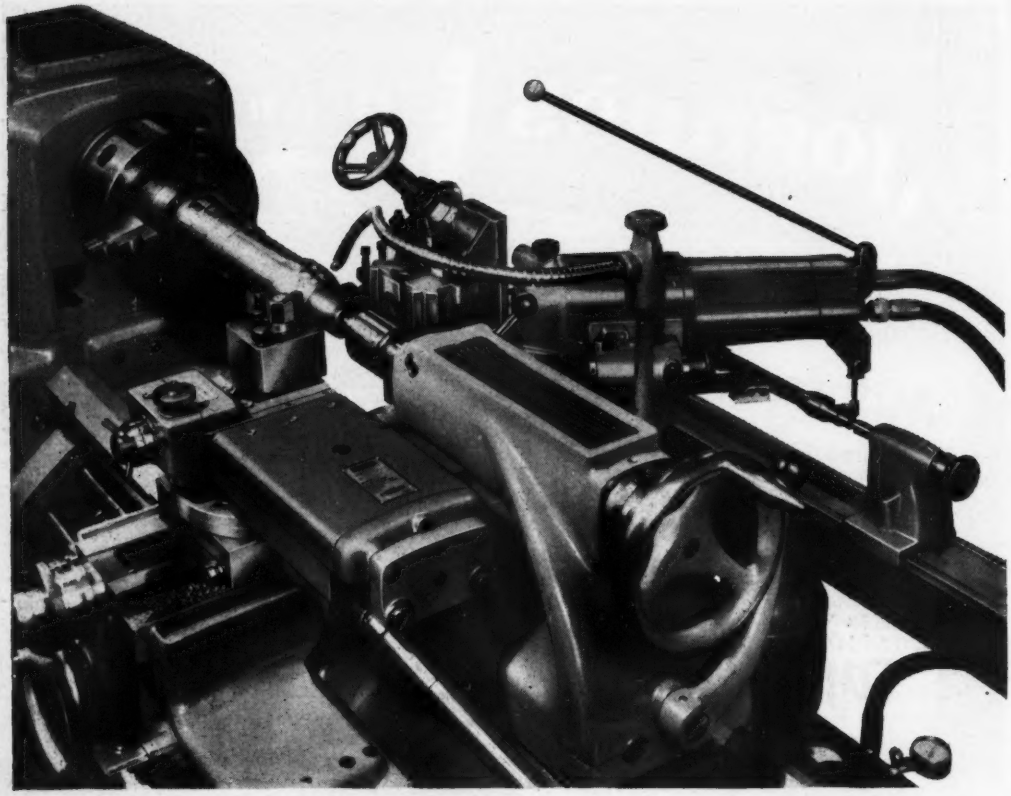

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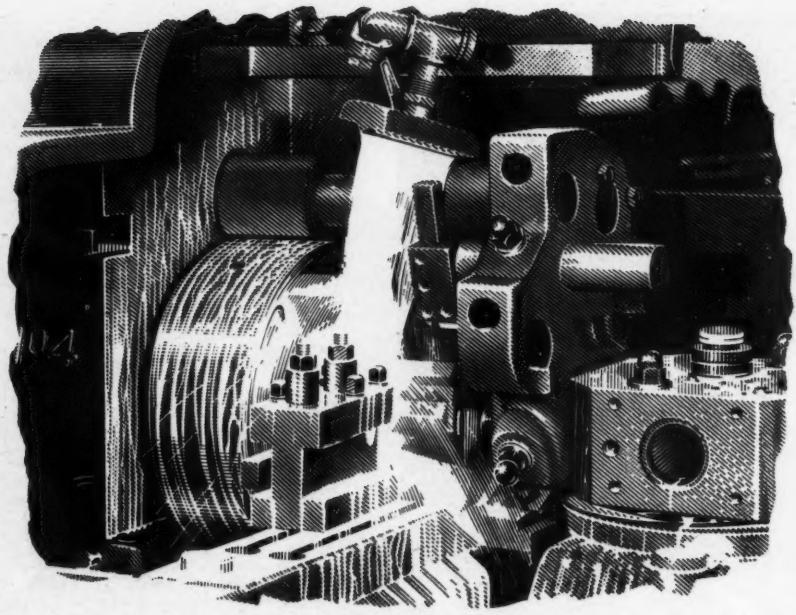

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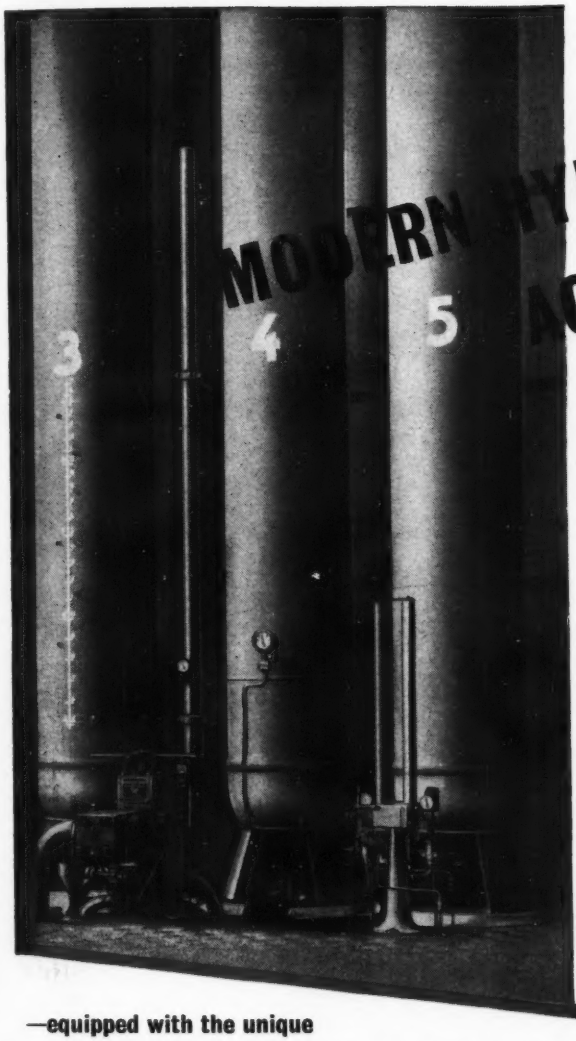

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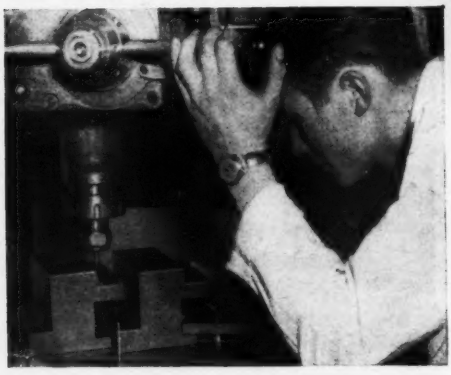

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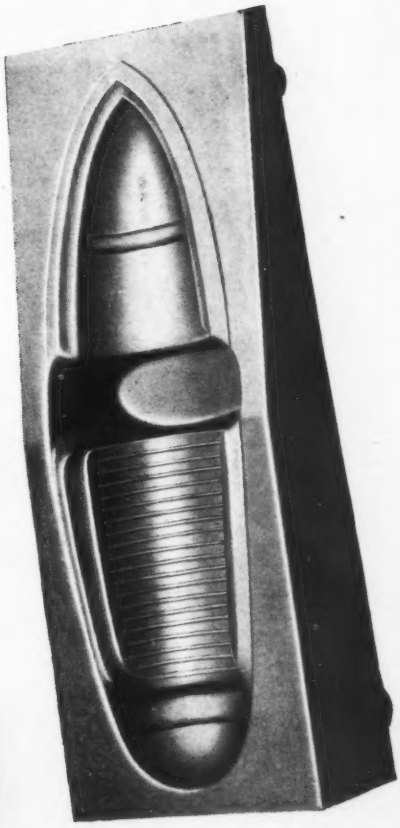

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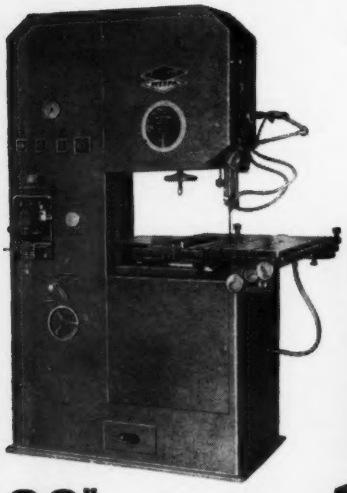

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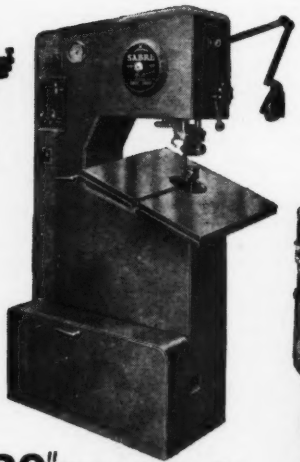

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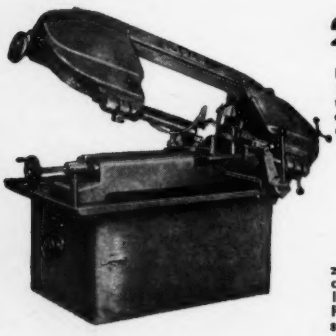

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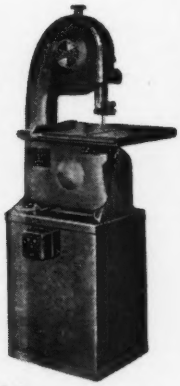

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Abstracts of Principal Articles

Making Plates for Data-processing Machines .. .. P. 120

In data processing machines built by Adrema, Ltd., Telford Way, Acton, London, W.3, printing plates are employed, whereon the required information is embossed. The plates may be made of zinc, aluminium alloy or tin-coated steel, and are of a variety of designs. Zinc plates are produced from sheet material, which is cut into blanks for feeding to "banks" of presses. Each bank provides for stamping, piercing, and bending, the latter operation being performed in three stages. In each bank, the individual machines are driven by a common motor, and are connected by belt-type work-transfer arrangements, whereby components are delivered to the vertical magazine of each press. From each magazine, workpieces are advanced into the tools by a shuttle-type feed mechanism, driven from the press crankshaft. The last machine in the bank is fitted with a stacking mechanism, the completed components being delivered to an inclined chute that extends from the front of the machine. On each bank, printing plates can be produced at a rate of 98 per min. (MACHINERY, 99—19/7/61.)

Building Dean, Smith & Grace Lathes P. 131

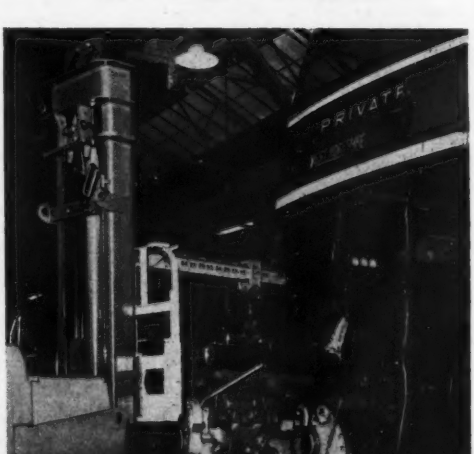
Well known for centre, toolroom, and surfacing and boring lathes, Dean, Smith & Grace, Ltd., Keighley, Yorks., was founded in 1865. The company decided to concentrate on the production of lathes at an early date, and these machines have been steadily developed. This article outlines briefly the history of the company and gives details of some of the equipment and methods employed at the Keighley plant. Illustrations show typical machining set-ups and arrangements for the assembly and testing of lathes. (MACHINERY, 99—19/7/61.)

Newall-Keighley Type BG Precision Plunge-grinding Machine .. .. .. P. 151

The Newall-Keighley type BG machine has been developed specifically for plunge-grinding operations on ring and disc-shaped components, and will accept workpieces of 3 to 10 in. diameter with plain cylindrical or profiled forms. The wheel-head is mounted on recirculating roller bearing slideways and the automatic grinding cycle is controlled by a hydraulically-operated cam mechanism. Two wheel-dressing attachments are provided, one for form-truing the wheel and the other for the periphery. Details are given of a typical set-up for plunge-grinding the groove in an inner race for a ball bearing. (MACHINERY, 99—19/7/61.)

❖ ❖ ❖

A Stacatruc fork-lift truck supplied by I.T.D., Ltd., Webb Lane, Hall Green, Birmingham, is being employed by the West Yorkshire Road Car Co., Ltd., at their central repair works in Harrogate, to facilitate dismantling and re-fitting heavy and bulky assemblies such as gearboxes and engines, and front and rear axles. To enable these operations to be performed effectively, special fittings and attachments were designed by the customer, also special pallets and racks. In the illustration, the Stacatruc, equipped with a specially-designed carriage and jib, is being employed to manoeuvre the front engine assembly into position in a Bristol Lodekka double-decker bus. It is reported that important savings in time and labour have been obtained



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If you know of a more efficient way of designing a tool, gauge, fixture, or mechanism, machining or forming a metal component, heat treating, plating or enamelling, handling parts or material, building up an assembly, utilizing supplies, or laying out or organizing a department or a factory, send it to the Editor. Short comments upon published articles and letters on subjects concerning the metal-working industries are particularly welcome. Payment will be made for exclusive contributions.

EDITORIAL

Advantages of Unit Tooling Systems

Particularly where a company has a wide range of products, many of which must be made in comparatively small batches, special difficulties are encountered in maintaining acceptable standards of productive efficiency in the various manufacturing departments. In a recent issue of MACHINERY, attention was drawn to the problem presented by indiscriminate multiplication of the number of different component parts required in connection with an extensive production programme, and to the benefits that may be derived from systematic efforts to achieve reduction of variety. Mention was also made of a system whereby simplification in manufacture can be obtained by reducing the number of basically different machine set-ups required in a particular organization. To this end, it may be recalled, various parts are arranged in groups, the selection being so made that those within a particular group possess similarities as regards both design and machining. A specification is next drawn up for a so-called "complex part" which incorporates the features of all the parts within the group. This "complex part" may exist only on paper. A set-up and tooling are then provided which would enable the "complex part" to be produced, and it follows that this set-up will cover the requirements for all the parts within the group. For any particular part, however, only certain of the tools and certain of the operation stages available with the "complex part" set-up will be required.

Regardless of what is accomplished in these directions, however, there will be very many instances where a decision must be made as to whether a jig or fixture shall be provided to facilitate machining and control of accuracy, or whether reliance shall be placed solely in the skill and experience of the operator. For any particular part, the decision must obviously depend largely on the nature of the work to be performed, the size of batch and the frequency with which such batches are likely to be required in the future, and the cost of making—and frequently of storing—a suitable fixture.

It is probable that in the future many parts which are needed only in small numbers will be efficiently produced without fixtures on machines equipped for tape or punched card control. These tapes can often be quickly and economically prepared, and stored for future use, and with such an arrangement the machining may be completed in considerably less time than would be required even by a highly skilled operator. Probably, however, it will very often be preferable to employ jigs or fixtures on orthodox machines, and it may be expected that increasing use will be made of unit tooling systems to enable such jigs or fixtures to be provided rapidly and at low cost, particularly where the numbers of workpieces required are insufficient to justify construction by normal toolroom methods.

As is well known, a unit system involves the use of a range of standard elements which can be held in stock and used for the construction of a wide variety of jigs and fixtures. There are certain proprietary series of these elements which have been devised with much ingenuity and enable a great many practical requirements to be met. These systems have already found wide application, although it appears that they are not yet being employed on anything like the scale which would be justified by the advantages that they offer. As has been pointed out, the standard elements available suffice for many purposes. At the same time, it seems probable that in numerous manufacturing organizations they could be usefully supplemented by other, more specialized—and possibly more elaborate—components that would facilitate the construction of jigs and fixtures for the particular classes of work involved. These components, although they would be adopted as standards within the factories where they originated, might not be of sufficiently wide application to justify their inclusion in series offered for general sale.

Where such a course was followed, it would be important to ensure that the parts introduced to serve as local standards were effectively integrated with those comprising the proprietary series, to enable both types to be incorporated in a single fixture with the maximum of convenience. In this way, the field of application for unit construction could be extended, and the utility of the proprietary parts enhanced.

Jigs and fixtures may often be assembled so rapidly from units, especially when some experience has been gained, that it may be economical to provide such equipment even for quite small batches of work. These fixtures, moreover, may frequently be designed extemporaneously by the tool-maker, who assesses the work to be per-

(*Continued on page* 170)

H2

Making Plates for Data-processing Machines

Methods and Tooling Employed by Adrema, Ltd., Acton, London, for the manufacture of Units for the Bradma Range of Equipment

By P. A. SIDDERS, Chief Associate Editor

IN ORDER TO IMPROVE EFFICIENCY in offices, both in industrial and commercial organizations, increasing use is being made of machines for handling the routine data associated with a variety of clerical work, including, for example, the preparation of invoices and statements, wage slips, production control forms, and plant maintenance instructions. Among the leading builders of such machines and associated equipment are Adrema, Ltd., Telford Way, Acton, London, W.3, who manufacture the Bradma range of equipment, and now form a branch of the Farrington Manufacturing Company, U.S.A. The latter company has been concerned with the production and handling of credit tokens for many years, and today is one of the principal makers of data-processing equipment in the U.S.A., and particularly of units arranged for optical scanning of printed characters.

Adrema, Ltd., was founded in London in 1923, as the selling and service organization for addressing machines in which embossed printing plates are employed. Subsequently, the company undertook the manufacture of plates in this country, and before the second world war, was engaged in assembling machines on a small scale. Machine building increased during the war, and the complete design and manufacture of machines was started at Acton in 1946. The company now has six factories in the Acton area and two at Portsmouth, with a total working area of 157,000 sq. ft., and provides employment for some 1,100 people.

Although the company was originally concerned with a simple addressing machine, the range of products has been expanded and developed to include complete data processing machines and systems, which are "tailored" to suit users' requirements. Bradma equipment is designed to form a link in mechanized office installations generally, and for use with computers, and the latest printing machine is seen in the heading illustration. All equipment is based on the principle of printing by means of a metal plate with embossed characters, which make contact with an inked fabric ribbon, and produce an impression on paper, card, or other material, supported on a platen. The whole or part of the data embossed on the plate can be printed at a single operation. The platens—usually termed "cut-out pads"—are flat, in order to ensure clear and uniform results of high quality. Generally, it is required to reproduce varying amounts of information from one plate, and the pads are therefore cut individually to ensure that only the desired portions of the data on a plate are printed. Semi- or fully-automatic attachments are available to enable information from different parts of a plate to be printed on one sheet of paper, and further information may be printed simultaneously with that on the plate, by means of loose type, line blocks, stereos, or numbering boxes, for example.

Plates for Bradma machines are made from zinc or aluminium alloys, also from electrolytically tin-coated steel, and those made from aluminium alloy may be anodized in a variety of colours to facilitate identification. Each plate is embossed so that the data can be read from the female impressions in one face, and the corresponding male characters on the opposite face provide for

printing. Revisions can be made—several times if necessary—merely by re-embossing the plate, and Adrema, Ltd., make various units for the embossing operation, including hand- and power-operated types.

TYPES OF PRINTING PLATES

Plates for Bradma machines are made in 81 different types, which fall into three main groups according to size. A selection of plates is seen in Fig. 1, with type IR plates at *A* and *B*, the example at *B* being shown inverted. This type of plate has capacity for four lines of information, with 38 characters in each line, whereas the type 2RT plate, seen at *C*, has capacity for seven lines, of 38 characters each, and the type 3RT plate, at *D*, has capacity for nine lines, of 46 characters. All plates are of a shallow "top hat" section, and plates of the RT design are slightly deeper than those of type R. A type 3R reference plate is seen at *E*. The flanges of all plates are produced by folding the metal to form a double thickness, with a narrow space between. Notches are cut along the edge of one flange of certain types of plates, and there are nine notches in the type 1R and type 2RT, whereas the type 3RT has 12, each notch being numbered. These notches provide for the insertion of metal or plastics tags.

A white plastics tags is seen at *F*, in the type 2RT plate, and serves for identification of the plate when it is filed vertically in the drawers of the special cabinets provided. Coloured metal tags are seen on the type 3RT plate at *D*, and include a double type-R tag *G*, a single type-R tag *H*, and a spring-lip tag *J*. These tags are made from thin brass strip (as will be described in a later article), and are painted in various colours for identification of the associated plate. The metal tags are also used for automatic selection of the plates on certain machines, which are equipped with the appropriate electrical system. In addition to the notches along the folded edge of the flange, there is a series of long notches in the edge of the blank for each type-RT plate. When the blank is folded, these notches result in a series of narrow slots between the lower portion of the flange and the nominally-vertical wall of the section. The slots are engaged by the lips of the spring-lip tags and serve to hold the latter in position. One flange of the type 3R reference plate is also cut and bent to form a slot, as at *K*, in which a white identification label can be inserted.

The plate *L* is of a type known as Model 3, and

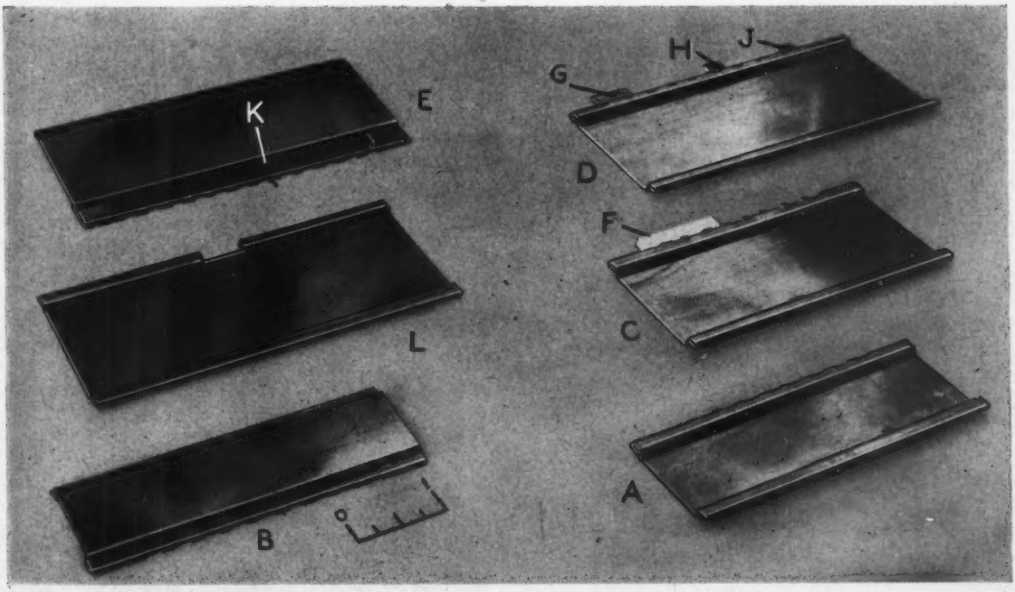


Fig. 1. Examples of printing plates from the range made by Adrema, Ltd., for use with their Bradma data processing equipment. Certain plates are seen fitted with identification tabs

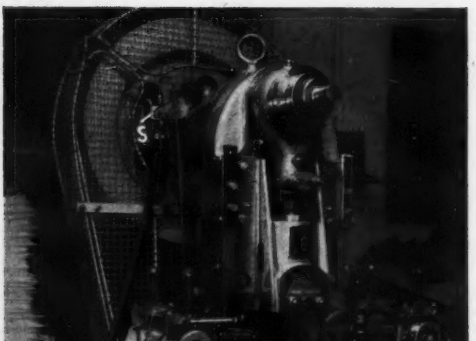


Fig. 2. Blanks for the production of printing plates are cut on this Humphris 10-ton press, which is equipped with double roll feed units and an air-operated stacking attachment

there are similar Model 2 and Model 1 plates. These plates have no notches or slots of the type already discussed, but each has a notch cut across the full width of one flange, the length of the notch depending upon the function of the plate. On all the plates so far considered, the notches are cut in the flange that is uppermost when the plates are stacked on edge. There is a further type of plate, known as a "grouper," which has a notch with a sloping end cut in the lower flange. A plate of this type is loaded into the printing machine at the end of a group of plates. When all the plates in the group have been automatically fed and used for printing, the "grouper" plate is advanced by the feed mechanism, and the notch in its lower flange allows a trip switch to open and stop the machine.

PRODUCING PLATE BLANKS

In the past, all printing plates were made from zinc sheet, and whereas steel, aluminium alloy and plastics are now being used for the purpose, zinc is still preferred for many applications, and the production of plates in this material is discussed in this article. Among the advantages of zinc may be mentioned the inherent oiliness of the surface and its resistance to corrosion. It has been found that zinc of the grade required for plate production cannot be obtained in the form of strip, which would obviously offer a number of advantages, but aluminium and electro-tinned steel, now being used on an increasing scale, are available in strip of suitable quality.

Zinc sheet for plate manufacture is produced by pack rolling and is free from directionality of

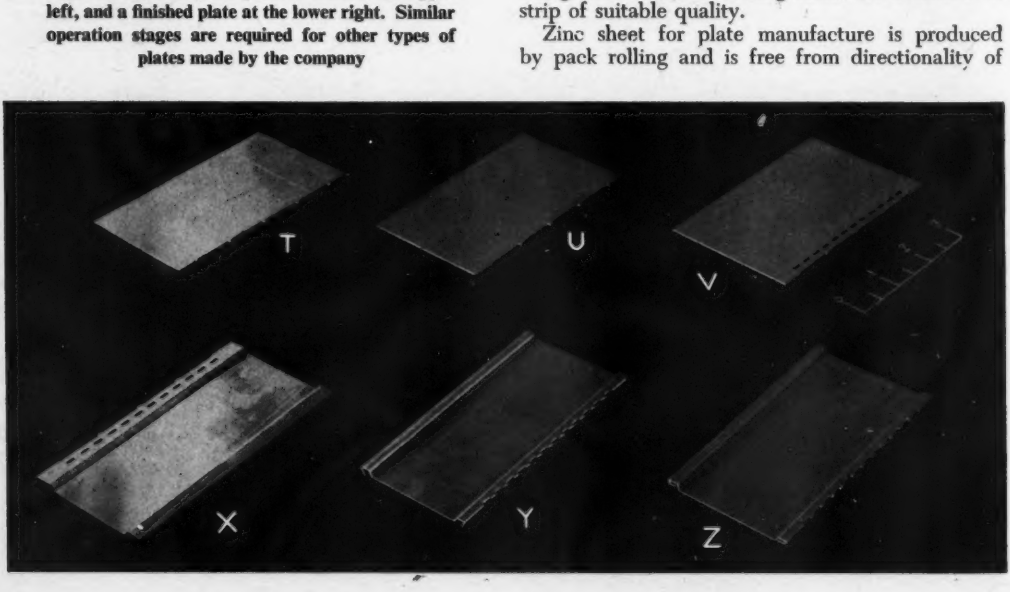


Fig. 3. Stages in the production of a Bradma type 3R printing plate are here shown. A blank made on the Humphris press is seen at the upper left, and a finished plate at the lower right. Similar operation stages are required for other types of plates made by the company

grain. Sheets measuring approximately 8 by 3 ft. are delivered to the Acton works loosely rolled for convenience of transport. On arrival at the plate-making department, the sheets are unrolled and fed to a Bliss gang-slitting machine on which each is cut into strips that are slightly wider than the length of the plates to be produced. Strip is cut 4 $\frac{7}{16}$ in. wide for type-3R plates, and 3$\frac{5}{8}$ in. wide for type-2R plates. After cutting, the strips of zinc are stacked for 48 hours to allow them to "settle." During this period, the weight of the metal removes any tendency for the strips to assume the original curvature of the sheets.

Fig. 4. Type 3R plates are made from zinc blanks on this line of presses known as a "bank." The machines are driven by a common motor, and are linked by belt-type transfer arrangements which deliver components to the magazines of the feed units on the individual machines

After they have "settled," the zinc strips are passed to a 10-ton Humphris power press, equipped with a double roll-feed mechanism. This machine is seen in Fig. 2, and provides for the production of blanks, which are 2$\frac{5}{32}$ in. wide for type 3R plates and 2 in. wide for type 2R plates. The blanks have three plain sides, and one long side wherein are cut the shallow notches that eventually form the slots for retention of the spring-lip tags.

The press is fitted with stacking equipment designed and made by Adrema, Ltd., and as each blank is produced, it passes through the die and into the chute *M*. This chute directs the blanks into a channel *N*, wherein they are stacked on edge, supported by a slider. One corner of the slider is seen at *P*, and it is provided with spring-loaded pads that engage the vertical walls of the channel. In line with the channel there is an air cylinder, just visible at *R*, and this cylinder is connected to a valve *S*, which is actuated by the cut-out cam on the press crankshaft. The piston rod of the cylinder is fitted with a rectangular block, with a rounded front end, which can move in the channel. At each cycle of the press, the block is withdrawn by the air cylinder, to allow the blank that has just been produced to fall into the channel. The block is then advanced to thrust the blank into contact with the stack, and to move the complete stack forward. On the Humphris press, blanks are produced at a rate of 120 per min.

PRESS LINE FOR PLATE PRODUCTION

Blanks are delivered in stacks to a line of five Edwards presses, each of 10 tons capacity, which provides for all the remaining operations required for the production of plates. There is a number of such lines extending lengthwise in the plate department of the Acton factory, and they provide for the manufacture of seven different basic types of plate, in zinc and aluminium alloys. Stages in the production sequence for a typical plate—the type 3R—from the blank *T* are shown in Fig. 3. A workpiece at the end of the first stage is seen at *U*. This stage provides for stamping numerals from 1 to 12 lengthwise adjacent to the notched edge, and even numerals from 2 to 12 transversely near one short edge, also the trade name BRADMA in one corner. The third stage has been completed on the workpiece at *V*, and it will be seen that a series of slots has been pierced that eventually form the notches along one edge of the channel form. At *X*, *Y* and *Z* are indicated workpieces at the end of the fourth, fifth and sixth stages, respectively, whereby the blank is formed to a channel section,

Fig. 5. A view of the "bank" of presses from the rear, with certain guards removed to show the common driving belt for the five machines

and the flanges are bent to give a double thickness. It may be mentioned that the component at *X* has been reversed, end-for-end, relative to the other plates in the illustration.

A representative press line—known in the works as a "bank"—is seen in Fig. 4, and each press is equipped with a vertical magazine to hold the work. The magazine for the first press is indicated at *A*, and has capacity for approximately 400 blanks, which are delivered to the end of the bank in narrow metal boxes. Magazines for the other presses are of similar design, but of smaller capacity, and each magazine has an independent shuttle feed mechanism, whereby the lowermost workpiece in the stack is delivered to the tool on the associated press. The presses are connected by 3-in. wide by ⅛-in. thick leather belts, as seen at *B*, which are inclined and continuously driven. At each cycle of the press line, a workpiece is thrust on to the lower end of each belt, and is carried upwards between guide plates, to be delivered into a chute that directs it into the magazine of the next press. The speed of the belts is so arranged that workpieces are transported somewhat more quickly than they pass through the presses, the possibility of build-up on the belts being thus avoided.

DRIVE ARRANGEMENTS FOR PRESS LINE

The complete bank of presses is driven from one motor of 5-h.p., and Fig. 5 gives a view of the bank from the rear, with certain of the expanded metal guards removed to show the drive arrangements. This transmission system, also the guards, magazines, and transfer equipment, have been added to the presses by Adrema, Ltd. The motor *C* drives a large pulley *D* on a countershaft at the far end of the line through the belt *E*. An endless loop of belt *F* passes round a pulley on this countershaft, over a jockey pulley on the near side of the countershaft and further jockey pulleys at the rear of the third and first presses, and then up over the crankshaft drive pulley *G* for the first

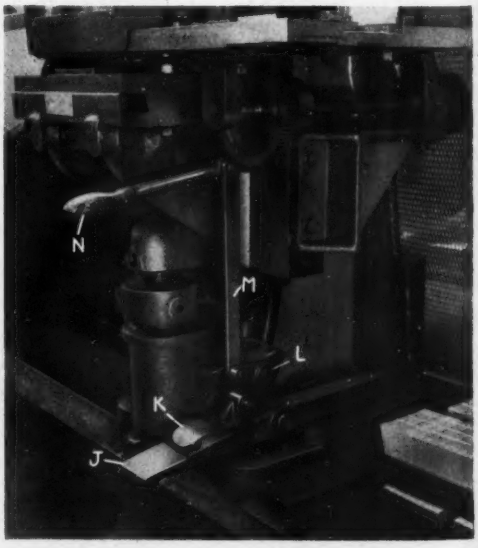


Fig. 6. Adrema, Ltd., have added an auxiliary pedal-operated latch to hold the clutch pedal of each press in the engaged position. All the clutch pedals in the line can be released by depressing a lever on any machine in the bank

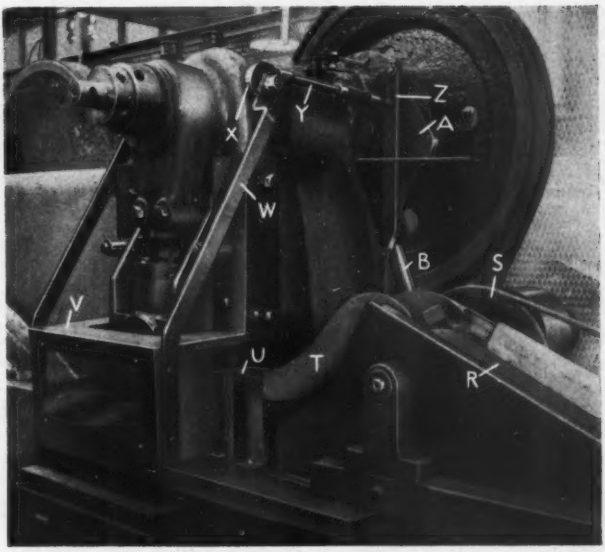


Fig. 7. Close-up view of a typical press in the bank, showing the vertical magazine and associated work delivery chute, also the guard which is interlocked with the clutch operating mechanism

press. The belt continues round this pulley, under an idler pulley *H* carried on a bracket secured to the press frame, and thence to the next press in the line where it passes under an idler pulley at the left-hand side, over the crankshaft drive pulley, and under an idler pulley at the right-hand side. Similar arrangements of idler pulleys are provided on the third and fourth presses, and from the right-hand idler pulley of the fourth press, the belt passes up over the drive pulley for the fifth press, and then downwards to the pulley on the countershaft.

Drive to the crankshaft of each press is transmitted from the main pulley by means of a conventional rolling key clutch, which is engaged by a pedal at the front of the machine. Since the presses are required to run continuously, the clutch pedal of each has been modified by Adrema, Ltd., as seen in Fig. 6. The original clutch pedal of the press is indicated at *J*, and the company has added a smaller auxiliary pedal *K*, which is integral with a pawl that holds the main pedal in the engaged setting. By depressing the pedal *K*, the pawl is released and the main pedal is free to move to the disengaged position. The pawl engages a bracket mounted on the side of the press base, and this bracket also carries a pivot for a short lever *L*. A link *M* couples the lever to a handle *N*, and the lever pivot shaft is also fitted with a striker on the far side of the bracket.

The arrangement is such that when the handle *N* is lifted, the striker is swung forward and disengages the retaining pawl for the clutch pedal, with the result that the clutch is disengaged and the press is stopped. On this press, and the others in the bank, the handle is keyed to a shaft that extends for the length of the installation, and passes through the press structures. The arrangement is such that if the handle on any press in the line is raised, the clutches of all the presses are disengaged and the complete line is stopped. This method of stopping is provided for emergency use, and any single press can be stopped by releasing the clutch pedal by means of the auxiliary pedal, as described.

BELT TRANSFER SYSTEM

In addition to guiding the main drive belt for the presses in the bank, the idler pulley at the left-hand side of each press (as viewed from the front) is employed to drive the work-transfer belt between that press and the adjacent unit. Each transfer belt passes over plain pulleys, and the shafts for these pulleys are supported on brackets which are carried on members that span the gaps between the presses. Fig. 7 is a close-up view of one of the presses, and the upper end of the belt whereby work is transferred from the previous machine is indicated at *R*. On the pulley shaft at this end of the belt is mounted a grooved pulley *S*, and there is a similar grooved pulley, of smaller diameter, on the shaft of the idler pulley of the preceding press in the bank. Drive is transmitted from the smaller grooved pulley to the pulley *S* by a ¼-in. diameter round-section leather belt, which is crossed to obtain the required direction of motion of the associated transfer belt. At *T* in Fig. 7 may be seen the brass chute, of shallow S-shape, into which the workpieces are fed by the transfer belt, and they slide down this chute into the vertical magazine *U*.

Adrema, Ltd., have paid special attention to the guarding of the presses in the bank, and each tool area is enclosed by a box-type guard when the unit is in operation. One such guard is indicated at *V* in Fig. 7, and it has windows of transparent plastics material, to enable the tools to be observed

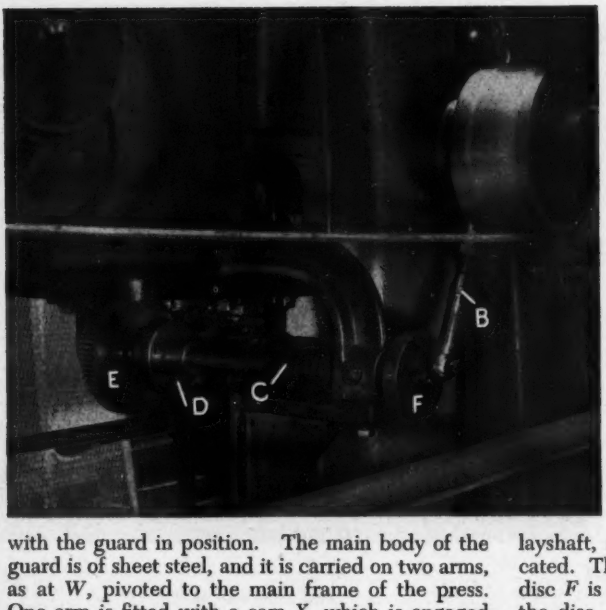


Fig. 8. The drive arrangements for a shuttle-type feed unit for delivering workpieces from the magazine to the press tool on a machine in the bank. The rod *B* is connected to a frame which is oscillated by an eccentric on the press crankshaft

with the guard in position. The main body of the guard is of sheet steel, and it is carried on two arms, as at *W*, pivoted to the main frame of the press. One arm is fitted with a cam *X*, which is engaged by a spring-loaded rod *Y*. The end of this rod remote from the cam is in the same vertical plane as a slot cut in the connecting bar *Z*, which links the clutch of the press with the actuating pedal (*J*, Fig. 6). When the guard is lowered to enclose the tool area, a "drop" on the cam allows the rod to move forwards, under spring pressure, so that it is clear of the connecting bar *Z*, and the bar is then free to move when the clutch pedal is depressed.

If the guard is raised, the rod *Y* is moved towards the rear of the press, and enters the slot in the connecting bar *Z*. The clutch cannot then be engaged, as the lower end of the slot contacts the rod *Y* if an attempt is made to depress the actuating pedal. It will be appreciated that the guard cannot be raised with the clutch engaged, since the lower end of the slot is then moved to a position above the rod *Y*, and axial movement of the latter is prevented by the solid portion of the bar.

SHUTTLE FEED MECHANISM

The shuttle feed mechanism on each press is operated from the crankshaft. An eccentric assembly has been added to each machine by Adrema, Ltd., and the housing for the eccentric is indicated at *A* in Fig. 7. An adjustable connecting rod, consisting of right- and left-hand threaded members, links the housing to a crank disc on the inner end of a layshaft. One end of the connecting rod is visible at *B*, and the lower end is similarly indicated in Fig. 8, which is a view from the rear of the press. The layshaft *C* is of 2-piece construction, and each portion is fitted with a flange, as at *D*, drive being transmitted between the flanges by a shearing pin. On the shorter—front—portion of the shaft is mounted a gear *E*, which meshes with a rack secured to the slide of the shuttle feed unit. As the crankshaft of the press rotates, oscillating motion is imparted to the layshaft, also the gear *E*, and the slide is reciprocated. The bearing portion of the crankpin in the disc *F* is eccentric to the end that passes through the disc, and fine adjustment of the travel of the slide is obtained by slackening-off the retaining nut and turning the crankpin.

Fig. 9 is a close-up view of the magazine and shuttle feed unit for the first press in the bank, which is typical of those fitted to other machines. A cast-iron support plate *G* is mounted above the vertically-adjustable knee of the press, and is fitted with a pair of hardened steel inserts *H*, which form a guideway of rectangular section. The ends of these inserts may also be seen at the upper right in Fig. 6. Within the guideway moves the slide *J*, of mild steel, which carries an insert *K*, made from gauge plate, and hardened and ground. The thickness of the work-material is 0·017 in., and the height of the insert is adjusted by means of packing strips until its upper face is 0·014 in. above the surface of the slide.

Pairs of guide strips are fitted to the support plate *G*, on the side nearer to the tool, and one pair of strips is seen at *L*. The space between the strips of each pair is set so that blanks that are 0·021 in. thick or more cannot pass between them. At each cycle of the press, the lowermost blank in the stack *M* (which normally rests on the slide of the shuttle feed unit) is engaged by the leading edge of the insert *K* and is advanced towards the tool. The blank is thrust between the guide strips if it is within the correct thickness limits, but if it is excessively thick, it cannot be advanced, and the safety pin incorporated in the layshaft

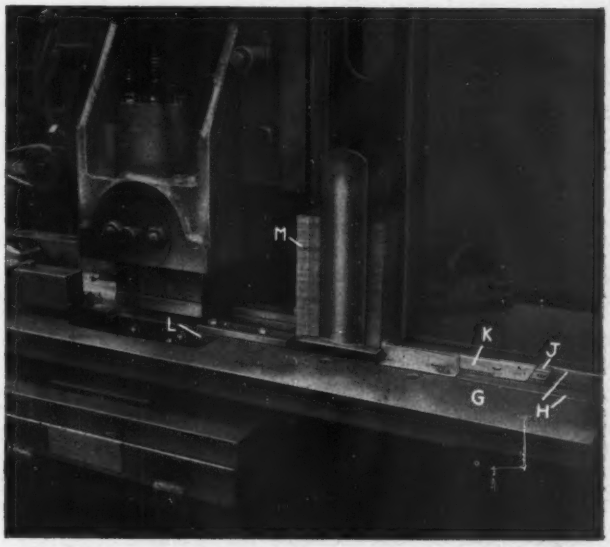


Fig. 9. The magazine and shuttle feed unit of the first press in the bank, which provides for stamping numbers and a trade name on the blanks produced on the Humphris press

assembly is sheared. Travel of the slide is adjusted by means of the connecting rod and eccentric crankpin to suit the type of plate that is being made, and the blank remains between the guide strips when the slide is returned. At the next cycle, the incoming blank thrusts the previously fed blank from between the strips and into the tool on the press, and that blank serves to eject the workpiece on which the operation has just been completed.

Only the leading edge of the insert is subjected to any considerable amount of wear, and this edge is reground at intervals of four to six weeks—after feeding from 1- to 1¼-million blanks. At the leading end of the feed-slide there is an adjustable stop screw, which is set to suit the tooling that is fitted to the press. For some pressing stages, the stop is set so that it just "kisses" the side of the bottom tool assembly, and for others, so that it delivers a sharp blow, depending upon the motion required as the workpiece enters the tool. From the tool, each workpiece passes into a channel-section guide, also beneath a felt pad that is pressed downwards by a leaf spring. This pad imposes a certain degree of restraint on the workpiece to retain it in the guide channel, and it is thrust out of the channel by the next piece that is ejected from the tool. From the channel, the piece drops on to the lower end of the transfer belt leading to the next press in the line.

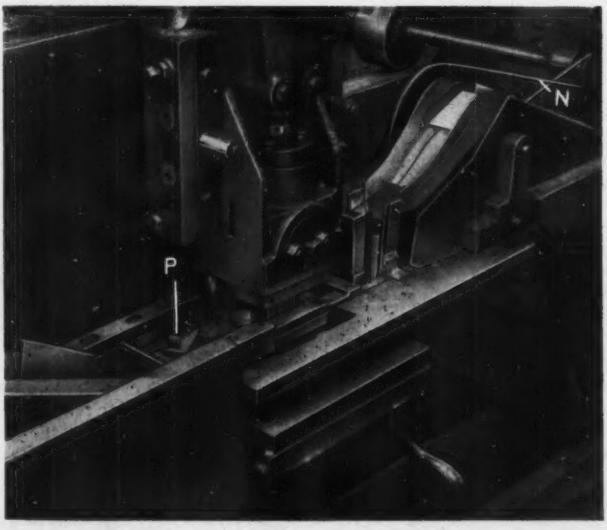


Fig. 10. On the second press in the bank, here shown, a series of slots is pierced in the blank near one long edge

PRESS TOOL DESIGN

The stamping tool fitted to the press seen in Fig. 9 is of conventional design, and has a plain anvil block in the bottom tool assembly. In the upper tool there is a heavy section plate wherein are machined pockets—two longitudinally and one transversely. Number stamps are inserted in one longitudinal and in the transverse pocket, and in the other longitudinal pocket are fitted spacing

Fig. 11. To ensure that workpieces are ejected rapidly from the press tool for the first forming stage, the guide chute leading to the transfer belt on the outgoing side of the press is fitted with freely rotating rollers

pieces and a stamp bearing the trade name. The stamps and spacing pieces are a slide fit in the pockets and each assembly is clamped by a screw at one end. All stamps are obtained from an outside supplier. This tool, like most of the others in the bank, has a spring-loaded guide strip at one side, whereby pressure is applied to the workpiece to maintain it in contact with a fixed guide strip.

A general view of the tooling on the second press in the line is given in Fig. 10. This machine provides for piercing the slots along one side of each workpiece, and there are 12 blade-type punches in the upper tool assembly. Each punch is 1·83 mm. thick by 4·5 mm. wide, and the lower end is ground at an angle of 5 deg. to provide a shearing action. To ensure balanced cutting, the cutting faces of adjacent punches slope in opposite directions. In this view may be seen the driving belt *N* for the transfer belt, also the S-shaped delivery chute and magazine. The latter unit, and the chute, are made from brass, to prevent damage to the workpieces. On the outgoing side of the tool there is a felt pad and leaf spring assembly *P* to restrain the motion of the ejected workpieces.

The first forming tool, on the third press in the bank, has spring-loaded guide strips at each side, which centralize the workpiece in relation to the forming members. Brake assemblies—each comprising a felt pad and a leaf spring—are provided on the in-going side of this tool and the next in the line. The stop screws of the feed-slides associated with these tools are arranged just to touch the lower tool bodies, and a sloping guide channel, incorporating rollers, is fitted on the outgoing side of the first forming tool to ensure rapid clearance of the workpiece. This guide channel is seen in the close-up view, Fig. 11. A solid forming punch, of a cross-section corresponding to that of the workpiece seen at *X* in Fig. 3 is mounted in the upper tool, and the lower tool has a spring-loaded, central, pressure pad to support the blank. At the sides of the pressure pad there are solid forming members, with inclined inner edge faces. As the upper tool assembly descends, the pressure pad is thrust downwards, and the workpiece is formed by the action of the punch and the side members of the lower tool. Spring-

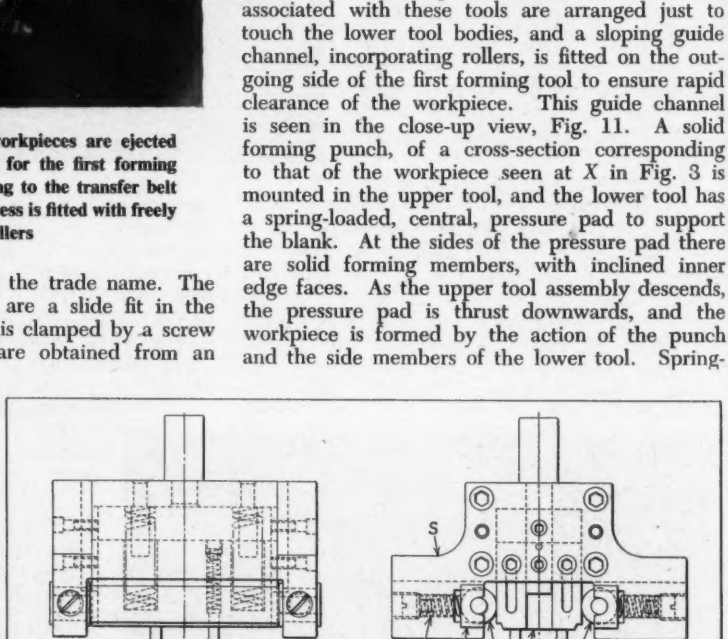


Fig. 12. Side and end elevations of the second stage forming tool. The upper tool assembly incorporates two spring-loaded rollers which bend the sides of the workpiece round the lips that extend lengthwise along the anvil block in the lower tool

loaded, headed, pins are incorporated in the upper tool assembly to hold the work against the pressure pad as the tool moves downwards, and to ensure that the component remains on the pad when the tool rises.

The second forming tool, fitted to the fourth press in the bank, is shown in Fig. 12. An anvil block, of built-up construction, is mounted on the baseplate, as indicated at *R*, and tapers slightly from end to end, in order to facilitate ejection of the work, since there is virtually no spring-back of the zinc material used. A partly-formed component is advanced into the tool, guided by the lips that extend along the outer members of the anvil block assembly. The upper tool has end-plates, as at *S*, in each of which there are slots that house sliding bearing blocks as seen at *T*. These blocks have flanges which engage the side faces of the end-plates, and radiused grooves are machined in the blocks to receive the integral stub-shafts of the rollers *U*.

A pressure pad, indicated at *V*, of a cross-section to suit the form of the partly-completed component, is free to slide vertically between the end plates, and is guided by keys at either end. Two powerful compression springs urge the pressure pads downwards, and movement is limited by dog-pointed screws that pass through the end plates to engage slots cut in the ends of the pad.

Springs, as at *W*, are housed in the end plates, and thrust the bearing blocks and rollers inwards, so that the rollers contact the side faces of the pressure pad. As the upper tool assembly is moved downwards, the pressure pad first engages the workpiece to hold it firmly against the anvil block. Then, as movement continues, the pad remains stationary, and the rollers pass down the sides of the pad, to engage the projecting portions of the workpiece, and bend them over the lips of the anvil block. Under spring pressure, the rollers then move inwards to bend the workpiece round the under-sides of the lips.

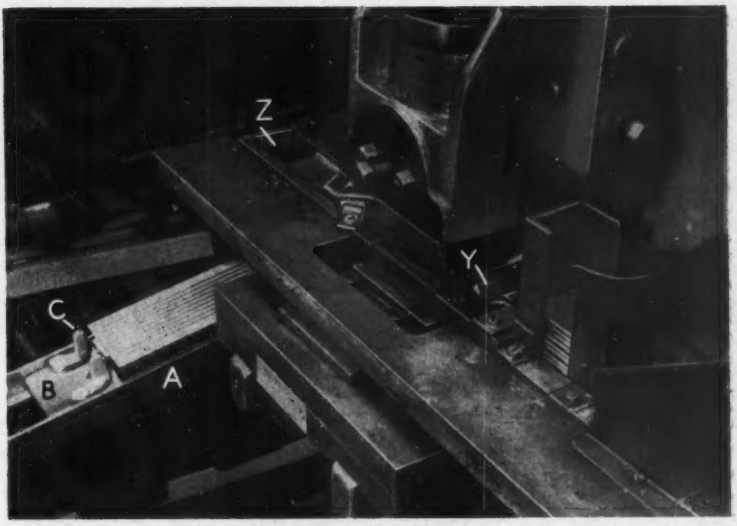


Fig. 13. General view of the last press in the bank whereby forming is completed. Completed plates are discharged into a chute that feeds a stacking unit, the work holder of which is seen extending from the front of the press

When the upper tool returns, as the ram of the press rises, the rollers are moved outwards against the thrust of the associated springs to the position shown, and the pressure pad is lifted clear of the work, which remains on the anvil block. A spring-loaded plunger *X* is fitted to the pressure pad to apply an initial thrust to the work and hold it in contact with the anvil block as it is fed into the tool.

The form of the workpiece after this stage (as seen at *Y*, Fig. 3) is such that a very simple tool suffices for the final forming operation. A built-up lower tool, of "solid" type, has a central block, the upper face of which is of a channel section to correspond to the final shape of the component. Blocks at each side of the central member serve to guide the partly-completed workpiece. The upper tool has a solid punch, of the required cross-section, with spring-loaded plungers to hold the workpiece initially, also to ensure that it does not stick to the top tool. As the punch contacts the work, the partly-formed flange at each side is thrust against the central block of the lower tool, and is bent under to form a double thickness. The relative positions of the upper and lower portions of each flange are governed by the solid contact between the punch, the body of the component, and the central seating block fitted to the lower tool.

Fig. 14. Drive arrangements for the stacking unit provided on the last press in the bank. A crank disc is oscillated from an eccentric on the press crankshaft, and, through a series of links and levers, serves to reciprocate a pusher

WORK STACKING ARRANGEMENT

Fig. 13 is a view of the last press in the bank which provides for final forming, and attention may be drawn to the use of felt pads and leaf springs, as at *Y*, to control the movement of the workpieces on the in-going and out-going sides of the tool. As each partly-formed workpiece is thrust into the tool, a completely finished component is ejected. At successive cycles of the bank, the component is moved along the guide strips on the out-going side of the tool until it is in line with the opening *Z* in the cast iron support plate. The component falls through this opening, and slides down an inclined guide, with its plain edge (to the rear during the passage along the bank) downwards, and comes to rest on top of the pusher of a stacking mechanism. At each cycle of the bank, this pusher is swung towards the rear to allow the component resting thereon to drop into the inclined stacking chute *A*. The pusher is then moved forwards to advance the stack of components along the chute *A*, against the resistance of the support block *B*. This block incorporates two spring-loaded plungers that engage the sides of the chute to impose a frictional restraint. When it is necessary to remove a stack of components, the plungers can be withdrawn into the block by moving two levers, as at *C*, together, and the block can then readily be moved clear. The levers can be actuated with the thumb and index finger of one hand, so that the line operator can support the stack with the other hand. Each stack of plates is placed in a sheet-steel drawer-type tray for storage.

Fig. 14 is a close-up view of the stacking unit from the rear, and shows the operating mechanism. An eccentric on the press crankshaft has been added by Adrema, Ltd., and the adjustable connecting rod from the eccentric housing is seen at *D*. At its lower end, the connecting rod is pivoted on a crank disc *E*, the shaft of which is carried by a bracket secured to the press structure. A link *F* is also pivoted on the crank disc, and imparts motion to a transverse shaft by means of a lever *G*, which is connected to the shaft by a shear pin. The shaft carries a second lever *H*, and this lever is coupled, by an adjustable connecting rod *J*, to an arm *K*, which is bolted to the pusher of the stacking mechanism. A semi-universal pivot is employed to couple the lever to the arm, to permit movement in two planes.

Indicated at *L*, the pusher is of bifurcated form and is pivoted between brackets that extend downwards from the cast iron support plate fitted to the press. These brackets also carry the stacking chute. The pusher is seen in the forwards position, with a completed component *M* resting on top of the arms that are in contact with the stack.

With the equipment that has been described, zinc plates are produced at a rate of 98 per min.

In the second article in this series, to be published shortly in MACHINERY, will be described a multi-stage press tool, with built-in transfer arrangements, which has recently been installed.

USE OF POWDERED METAL COMPONENTS IN CARS.—Mr. W. P. Balthrop, president of the Amplex Division of Chrysler Corporation, recently pointed out that the use of iron base powdered metal components in the U.S. car industry has increased by 300 per cent since 1954, and predicted a further rise of 100 per cent in the next five years. In the average 1961 car made by the Chrysler Corporation there are 103 powdered metal parts, including numerous self-lubricating porous bearings.

The Amplex Division now has a monthly output capacity of more than 40 million parts, which range in diameter from $\frac{1}{16}$ to 30 in., and have individual weights up to 350 lb. Pressures as high as 90 tons per sq. in. are employed, and press capacities range from 36 cwt. to 2,700 tons.

Building Dean, Smith & Grace Lathes

By P. A. SIDDERS Chief Associate Editor

AMONG THE LEADING BUILDERS OF LATHES in this country, the firm of Dean, Smith & Grace, Ltd., Keighley, Yorks., can trace origins back to the partnership of three Keighley engineers in 1865. A factory was provided on the present site which was purchased from the Duke of Devonshire, and comprised single-storey buildings and a foundry. Power was supplied by a Cornish-type boiler, operating at a pressure of 60 lb. per sq. in., and it may be of interest to mention that the company was one of the first in the Keighley district to adopt arc lighting, which was installed in the foundry. In this connection, it may also be mentioned that one turning shop in the present works was one of the first in the country to be equipped with fluorescent lighting.

At an early stage, it was decided that the company should concentrate principally on the building of lathes, and these machines have been steadily developed and sold in large quantities to users in this country and throughout the world. During the depression that followed the first world war, much of the older plant and equipment was replaced, and jigs and fixtures were made to facilitate operations on the company's products. In consequence, it was possible to expand production rapidly when the need arose in the years immediately preceding the second world war, and during that war an output of about 100 lathes per month was maintained, with a peak of 107 machines in the month of the Dunkirk evacuation. Apart from certain castings, all components for these lathes were made in the Keighley works.

The company's lathes were further developed after the end of the war, and a fully redesigned, new range, incorporating improved materials and mechanisms, was introduced at the 1948 International Machine Tool Exhibition at Olympia. These machines have since been the subject of further refinement, and 14 basic types of lathes are now in production, including surfacing and boring lathes of 16, 20, and 24 in. swing, a toolroom lathe of 17 in. swing with relieving facilities and centre lathes with swing capacities ranging from 13 to 32 in. An extensive range of attachments is available for these machines, and most centre lathes are arranged for the provision of hydraulic copying.

Dean, Smith & Grace, Ltd., now have some 700 employees, many with long service—in some instances, more than 50 years. To provide for the future, the company has a well-organized apprenticeship scheme, run by a full-time apprentice supervisor. There are 48 apprentices who are trained for a minimum period of five years, and each follows a specific programme in the various departments of the works. Apprentices are allowed one day each week for study at the local technical school, and are provided with meals free until they are 18 years of age, and with meals at half-price until they are 21.

The accompanying photographs shows some aspects of the Keighley works, also the machines and equipment employed. Iron and aluminium castings are supplied by the company's foundry, which has two cupola furnaces for iron, and produces 120 tons of finished castings per month, the output including lathe beds up to 25 ft. long. Five jolt-squeeze machines serve for the production of moulds for small and medium size castings, and moulds for beds up to 14 ft. long are made in boxes, with the shears formed by cores that incorporate densifiers. Cores are produced on two Hansberg Coreshooters. A railway siding runs at one side of the foundry, and iron and coke are delivered direct to the loading platforms for the cupolas.

In the main machine shop there is an extensive gear cutting section, with David Brown No. 7 Hydrax, MT.2 and MT.15 hobbers, Sykes V10B shaping and underpass shaving machines, and a Holroyd rack-cutting machine. All gears used in Dean, Smith & Grace lathes are either made from toughened steel and shaved, or are hardened and ground. For grinding, the facilities include four Orcutt machines of 24-in. capacity, and one fully automatic machine by the same maker. A Maag machine is installed for grinding helical headstock gears, and will accommodate gears up to 11¾ in. diameter by 11 in. long. Gear blanks are produced on a battery of B.S.A. single-spindle chucking automatics, two with capacity for work of 9 in. diameter, and a further two for work of 5 in. diameter.

Feed-shafts are made from precision ground bar, and the keyways in these shafts are cut on an Archdale milling machine with capacity for work up to 10 ft. 8 in. long. As may be seen from Fig.

(*Continued on page* 135)

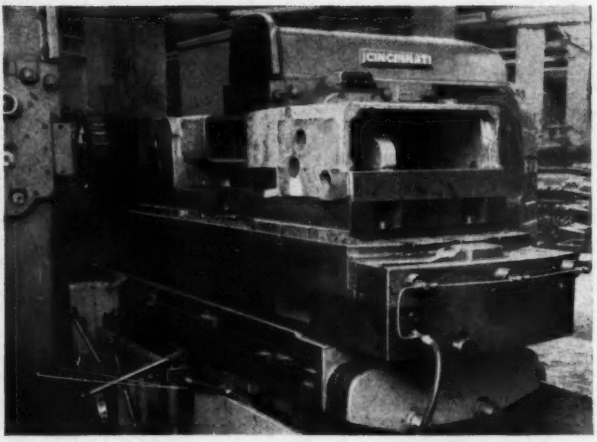


Fig. 1. This recently-installed Cincinnati Duplex milling machine has been fitted with a sub-table by Dean, Smith & Grace, Ltd., to enable a component to be loaded while another is being machined. At the completion of an operation, the table is swung through 180 deg., to locate the fresh component in the cutting position, and is clamped by hydraulic units at each end, which are connected to a lever-operated pump. This arrangement has led to a reduction of 60 per cent in the floor-to-floor times for milling slides and gearboxes

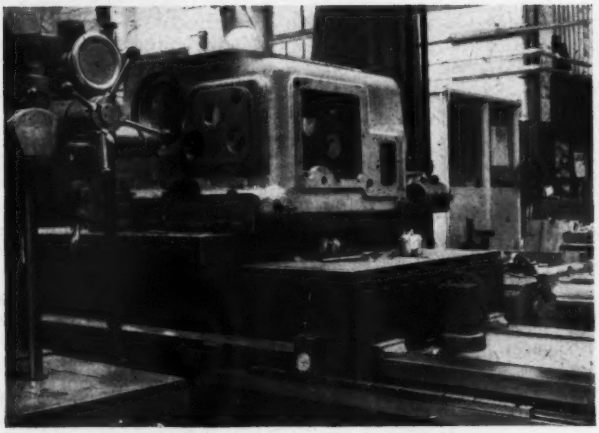


Fig. 2. Finish boring the headstock casting for a Dean, Smith & Grace 22 in. swing lathe on a Kearns type OPT horizontal machine, which is fitted with a planer-type table. Steel bars with accurately-positioned vee-notches are used in conjunction with dial indicator gauges for setting the work transversely and the spindle head vertically, and a bar and indicator gauge can be seen mounted on support brackets at the side of the table and saddle. Snout boring is employed, and the boring bars have cartridge tools with micrometer adjustment

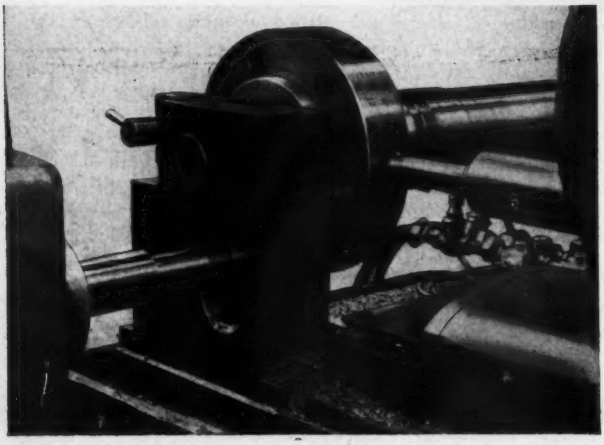


Fig. 3. Close-up view of the set-up, on one of a battery of Kearns S-type horizontal boring machines, which provides for finishing the axial and radial holes in the cam-lock noses for lathe spindles. The boring bar at the left is mounted in the main spindle of the Kearns machine, and the bar at the right is fitted to an independently-driven spindle, mounted in a slide which has power traverse on guideways on the fixture base. The lathe spindle is located by a plunger that engages the rough-machined axial holes

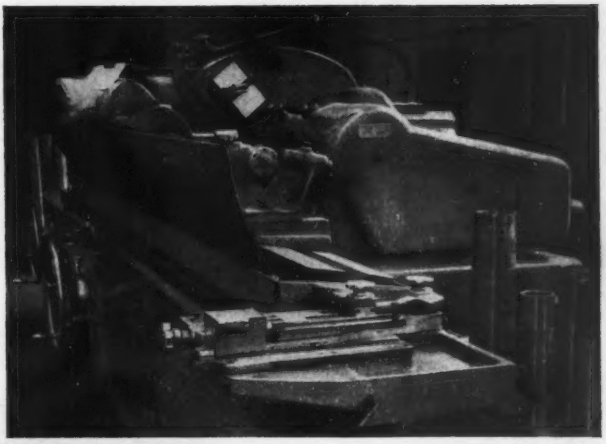


Fig. 4. This Landis Lund cylindrical grinding machine has been specially adapted for finishing the steep-taper conical spigots on the cam-lock noses of spindles fitted to Dean, Smith & Grace lathes. An additional support bracket, as seen in the foreground, is provided for the upper member of the work-slide, which can be swung through a maximum angle of 15 deg. to the machine axis. The angular settings are made by means of the screw adjustment incorporated, with reference to a scale and vernier or to a dial indicator gauge which is used in conjunction with a length bar

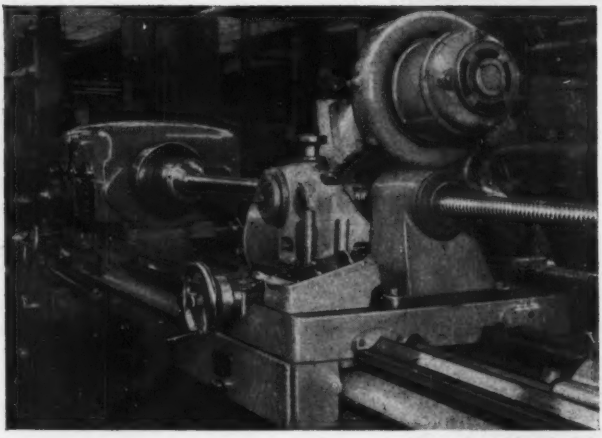


Fig. 5. Leadscrews for Dean, Smith & Grace lathes are first turned on one of the company's machines of 18 by 240 in. capacity. The threads are then rough cut on this 18- by 156-in. lathe, which is provided with a collet attachment for the spindle, and has been specially modified by fitting a saddle assembly to support a Burgsmuller type L.4 thread-whirling head. The latter unit provides for cutting leadscrews from $\frac{3}{4}$ to $2\frac{1}{2}$ in. diameter, with Acme threads from 2 to 5 per in. Normally, 0·007 in. of metal is left on each thread flank for finishing

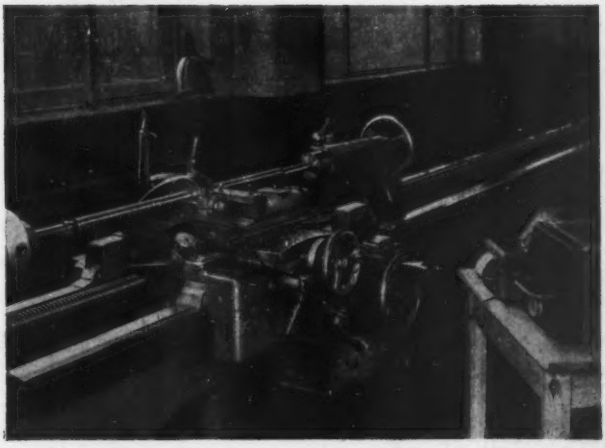


Fig. 6. All leadscrews are finished on this correcting lathe which was built by the company and is housed in a temperature-controlled room at the Keighley plant. The saddle is driven by a leadscrew between the bed-ways, and the cross-slide carries a tool-slide mounted on crossed-axis roller guides. As the saddle is traversed, the tool slide is moved axially by a roller-lever follower that engages a correcting cam between the bed-ways. The lathe is here seen being checked with an N.P.L.-certificated master screw. A probe, on the tool-slide, is connected to Taylor-Hobson recording equipment

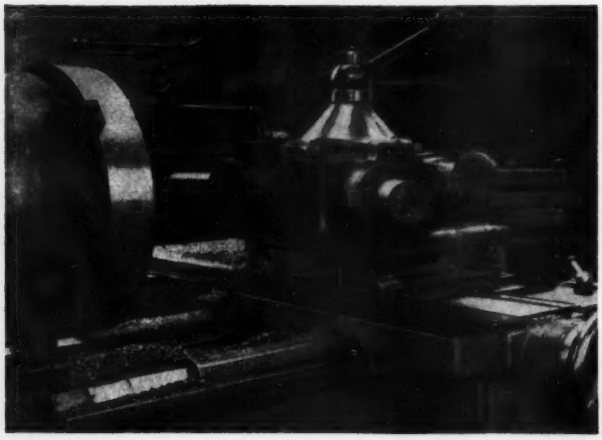


Fig. 7. The set-up for machining faceplates on one of the company's 20-in. surfacing and boring lathes. A multiple tool *A* provides for boring the inner end of a stepped hole to 3 in. diameter, chamfering the end of the hole, boring a parallel register to 5·359 in. diameter, − 0, + 0·006 in., roughing a taper bore, chamfering the end of the taper bore and facing a narrow land. The taper bore is finished with the floating reamer at the left, and the land is again faced. Subsequently, the front of the workpiece is machined to blend with the land face

Fig. 8. Part of the standards room at the Keighley works. To the right is seen a recently installed Klingelnberg involute and lead testing machine, with Taylor-Hobson Talyrond and Talysurf units to the left. Other equipment in the standards room includes a horizontal universal comparator and a toolmakers' microscope by Cooke, Troughton & Sims. Before each newly-built lathe is released, it is used to machine a test piece, which is checked for roundness with the Talyrond unit. A graph recorded by this unit is marked with the machine number and filed for reference

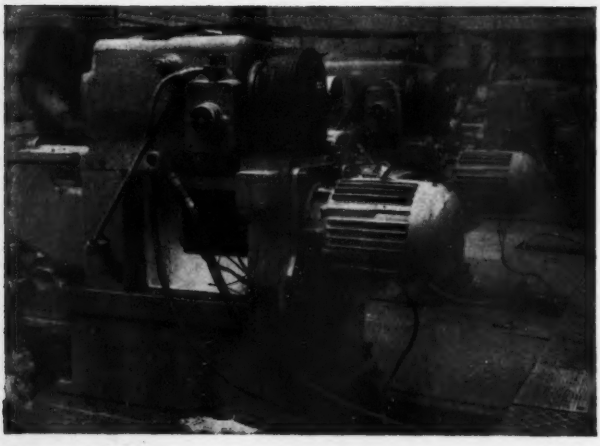


Fig. 9. One end of the final assembly and test bay for Dean, Smith & Grace lathes. Each machine is connected to the electrical supply by way of a plug and a socket in the floor, and is run for a minimum of four days. During this time, oil is pumped into the headstock, by way of armoured hose, and is returned, by a second hose and piping below the floor, to a Sharples centrifuge, in which it is cleaned before being recirculated. This practice ensures that all foreign matter is removed from the headstock assembly before despatch

Fig. 10. A work-handling unit, here seen set-up for the treatment of cam-lock spindle noses, has been designed and built by the company for use with the Wild-Barfield high-frequency generator seen in the background. Work can be mounted between centres, or in fixtures, and the unit is employed for induction hardening the ends of teeth on gearbox and apron gears, saddle screws, and the faces of interchangeable tool blocks and holders. The company makes all the work-coils required

(*Continued from page* 131)

5 and 6, leadscrews are rough machined on a Dean, Smith & Grace lathe fitted with a Burgsmuller thread-whirling head, and are finished on a correcting lathe built by the company. The latter machine is housed in a temperature-controlled room, and three master leadscrews, which have been corrected and certified by the N.P.L., are used for calibrating purposes. Another of the company's lathes has been fitted with a Foster unit for superfinishing the bearing surfaces of main spindles, also tailstock spindles.

There is a variety of boring machines in the Keighley works, including a De-Vlieg type 3-B; three S-type and seven other Kearns; and a No. 2 PRT and two type 2A Richards machines. Boring operations are now carried out mainly by the snout method. Large headstocks are rough bored, stored for three days and then finished. Smaller headstocks are heat treated to relieve stresses between roughing and finishing. All gearboxes are rough-bored on a radial drilling machine, and are finished on a small Kearns borer fitted with a multi-spindle head. Two boring operations are illustrated in Fig. 2 and 3. A Herbert turret drilling machine has been installed which will be used with a co-ordinate positioning table to eliminate the use of jigs.

For initial machining on major components, such as beds, there are six planers by Stirk, Butler and Swift-Summerskill, one with a 26-ft. table, one with an 18-ft. table, and the remainder with 12-ft. tables. For finishing the guideways of beds, the company employs Churchill slideway grinders, of which there is one with an 8-ft. table and two with 6-ft. tables.

A large heat-treatment department provides for conventional hardening and other operations. Adjacent to this section is installed a Wild-Barfield-A.H.F. induction hardening unit, for which the company has designed and built work hand-

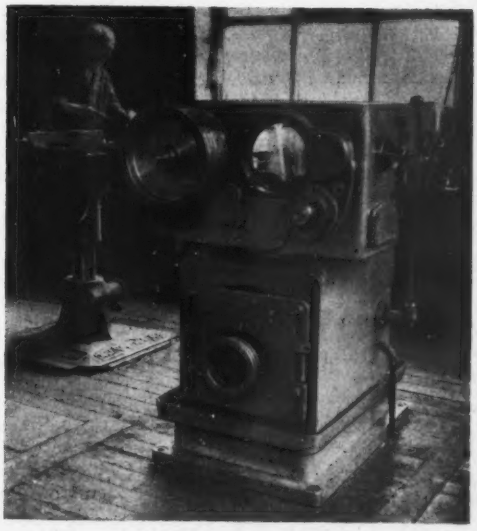


Fig. 11. A headstock for a Dean, Smith & Grace 18-in. lathe is here seen on one of the special stands that have been built for use in the sub-assembly department. The stand supports the work during the fitting and assembly operations, and a motor in the base provides for running, which is carried out for 1 hour at this stage. In the background can be seen a universal rotating and tilting stand for the assembly of smaller units such as aprons and slides

ling equipment as seen in Fig. 10. The same high-frequency generator is used for tool tip brazing.

Particular attention is paid to the finishing of machines, which can be supplied in any of a range of 12 standard colours. In the main paint shop, drying is carried out with the aid of batteries of infra-red lamps, which can be operated in groups by means of selector switches. These lamps permit a temperature of 320 deg. F. to be maintained, and the average time for applying and drying each coat is 20 min. A new paint shop has recently been brought into use for finishing lathe beds and bases. Paint is heated before it is sprayed on to the work, which is supported over floor grids measuring 20 by 10 ft.

As would be expected, there is a large turning department with batteries of the company's surfacing and boring lathes—a typical set-up being shown in Fig. 7—and Ward turret lathes. A servicing department at one end of this shop is responsible for grinding all tools.

Dean, Smith & Grace, Ltd., are fully aware of the requirements of modern engineering industry, and are continually striving to improve their products. To this end, their past policy of keeping plant completely up to date is being continued, and notable new installations include an additional dynamic balancing machine and a Reishauer gear grinding machine. Many other new machines are to be added to the plant in the near future, and an extensive new experimental department has recently been completed. It is considered that the conditions under which Dean, Smith & Grace lathes are now built meet the severest requirements, and ensure that the highest standards of quality and performance are maintained.

Duax ZL.13/A Hammer-Drill Portable Drilling Machine

Wood, brick, and concrete, for example, can be drilled, using the same cutting tool, with the aid of the Duax ZL.13/A Hammer-Drill portable drilling machine, which is marketed by Trend Industrial Equipment, Ltd., 77 & 95 Dudden Hill Lane, London, N.W.10. Special solid and hollow tungsten carbide-tipped drills are available, for cutting holes ranging up to 2⅝ in. diameter by 14 in. deep.

The hammer head is of small diameter, thus enabling holes to be drilled close to corners as seen in the accompanying illustration, and blows are imparted at rates of 13,000 or 7,500 per min. Spindle speeds of 1,300 and 500 r.p.m. are obtainable, and the head can be detached, to enable the unit to be used for conventional drilling operations, the capacity then being ½ in. diameter. A bench-mounted stand for the Hammer-Drill is available as extra equipment.

Duax ZL.13/A Hammer-Drill portable machine which enables various materials to be drilled with the same tungsten-carbide-tipped cutter

MAGISTER IGNITION SYSTEM FOR 2-STROKE ENGINES. An ignition system claimed to afford important advantages for 2-stroke engines has been developed by Wipac Group Sales, Ltd., London Road, Buckingham. The system, known as the Magister, is based on a high-frequency condenser discharge principle, with a high rate of spark.

Ignition failure caused by excess oil or dirt on the contact breaker is also avoided by arranging for the closing of the contact points to produce the spark. Condenser discharge ignition is not new, but it is stated that previous systems have proved too expensive to produce for large scale application. It is claimed, however, that the Magister system is economically practical, with the added advantage of being suitable for use with a standard sparking plug instead of the surface discharge type found necessary with previous systems.

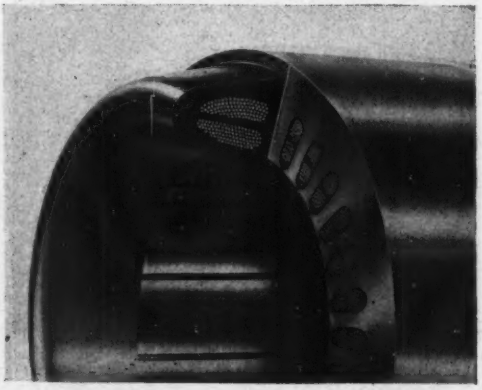
While the advantages of the system are not so pronounced for the 4-stroke cycle, it has been found possible to use varying grades of fuel in a standard 4-stroke petrol engine with no special adjustment to the ignition timing or carburetter.

NewmanSEAL Electric Motors

Electric motors in the new NewmanSEAL range introduced by Newman Industries, Ltd., Yate, Bristol, have resin-impregnated stator windings which afford protection against attack by moisture, oil and most chemicals, also the abrasive action of airborne particles.

These motors are available in open drip-proof and totally-enclosed types in sizes from 0·5 to 125 h.p., and a cut-away view of a stator with encapsulated windings is given in the figure. Protection for the rotor is afforded by a coating of epoxy resin applied by spraying, and seals are fitted to prevent ingress of fluid to the bearings for the rotor shaft. The terminal box has wide flanges fitted with special gaskets, and taped, moisture-proof, connections are made between loose leads in the box and the ends of the stator windings.

The epoxy resin employed for encapsulation is stated to be sufficiently resilient to withstand repeated expansion and contraction caused by temperature variations when the motor is in operation, and has been produced as a result of a 5-year programme of development and testing which has been undertaken by the company. Open-type drip-proof motors with encapsulated stator windings, it is stated, may replace conventional totally-enclosed machines for applications where resistance to corrosive fumes and moisture is required, and since air can circulate within the motor, condensation is avoided. It is pointed out, however, the NewmanSEAL drip-proof motors are not intended to replace totally-enclosed machines for operation in conditions where large quantities of dirt in the atmosphere are likely to clog the air gap between the stator and the rotor. Encapsulation of the windings for a totally-enclosed motor gives protection from attack by condensation, also from fumes which may be drawn into the machine.



A cut-away view of a stator with resin-encapsulated windings for a NewmanSEAL electric motor

Computer Control Equipment for a Billet Cutting Line

On a line at the Stocksbridge works of Samuel Fox & Co., Ltd., high-quality steel billets, of various compositions and with lengths up to 450 ft., are cut, in accordance with the customers' requirements, immediately after discharge from a reversing mill. Cutting, which precedes final rolling, may be carried out so as to provide for billets to a specified nominal length, to any length within a selected range, or to a number of dimensions in a range. Cutting involves a maximum of three successive operations, depending on the original length.

To provide for the optimum utilization of material, equipment which was designed and installed by E-A Automation Systems, Ltd., Century Works, Lewisham, London, S.E.13, a member company of the Elliott-Automation Group, was brought into operation in February this year. This equipment is based on the No. 609 information system, which was developed by Panellit, Ltd. (another member company), and incorporates an Elliott No. 803 general-purpose digital computer. The principal units of equipment are shown grouped together, prior to installation, in the accompanying illustration. The installation provides for automatically calculating the positions of the optimum cutting points on each billet, and displaying on the console units seen at the left, which are mounted at convenient positions adjacent to the line, the information required by the operators for setting the parting and hot saws, for cutting billets up to 180 and 30 ft. long, respectively, and the gang shear, for lengths up to 8 ft. Information relating to customers' requirements is introduced by means of knobs on the unit seen in the left background, and provision is made for repetitive operation of the equipment, when a number of billets of the same length is to be cut. The setting controls are duplicated, to permit input of data for two successive orders.

In operation, a button is depressed by the mill operator before the final rolling pass is taken on a billet. As a result, equipment is energized whereby the overall length of the billet is measured by a

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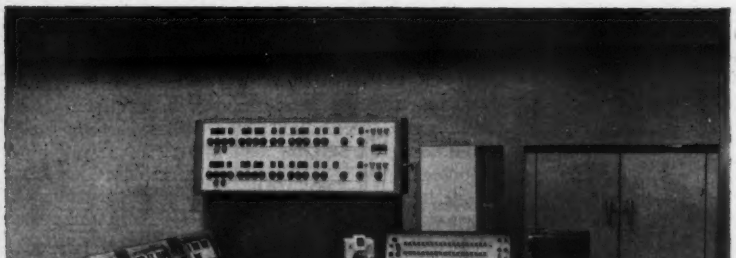


Designed by E-A Automation Systems, Ltd., this computer equipment is installed in the Stocksbridge works of Samuel Fox & Co., Ltd., and provides information for billet cutting

system which counts the pulses obtained from magnetic strips that rotate with the rolls. By means of lead sulphide detectors, which are set at known distances apart along the discharge table, compensation is made automatically for slip or for wear of the rolls. During calculation of the cutting points, which is completed in less than 1 sec., provision is made for obtaining test pieces, also for the average amount by which the work may "bounce" after being thrust against the stops at the cutting stations. The information is stored until demanded by the operators, by means of push-buttons on the consoles, and it can only be supplied in the correct sequence. Provision is made for automatically printing all the data, for record purposes.

Soft Magnetic Vice-jaws

The Speetol soft magnetic vice-jaws shown in the accompanying illustration have recently been introduced by Speed Tools, Ltd., Verecker House, Gresse Street, London, W.1. Each jaw comprises a moulding of tough thermoplastics material, which incorporates small permanent magnets. Thus, although the jaws can be "snapped" quickly into position on the vice, and as easily removed, they are not readily dislodged accidentally. Slight plastic deformation of the material, when the vice is tightened, ensures that small, delicate, or polished parts are held without damage. The jaws are of sufficient thickness to allow the working faces to be restored by filing, should they become excessively pitted in use.

A feature of the jaws is that they can be used as permanent jigs for holding awkwardly-shaped items, including threaded components. For this purpose, one of the components is heated, gripped between the jaws in the vice, and left to cool. Accurate, closely-fitting impressions are thus produced, which can then be used for holding components of that particular form. For small items of various shapes, several such impressions can be incorporated in each pair of jaws. Special jaws prepared in this manner can be kept in the tool stores, and re-issued to the shops when required. The jaws are available in three sizes, designated 1, 2, and 3, which are suitable for 2 to 3-in., 3½ to 4½-in., and 5 to 7-in. vices.

These Speetol soft magnetic vice-jaws, for holding delicate and awkwardly-shaped pieces, are of tough thermoplastics material which can readily be moulded to the form of the work

The Use of Snap-action Switches for In-process Size Control

By KARL-HEINZ WOLFRAM, Dipl. Ing.

VARIOUS TYPES OF EQUIPMENT for in-process size control on machine tools, notably internal and external cylindrical grinders, are now available and are finding increasing application for high-production set-ups. These units are mainly of pneumatic, electric, and electronic types, and some form of magnification system is an important feature of such an arrangement. Very small changes in the size of a workpiece during grinding are magnified, either electrically or pneumatically, and the resultant amplified movement is employed to actuate switches whereby the automatic cycle of the machine is controlled.

Recent developments concerned with in-process gauging, however, have included the use of ultra-high-precision snap-action switches which are operated directly as a result of size variations in a workpiece, and it will be appreciated that with this type of equipment it is not necessary to make any provision for magnification.

One such switch, used in control equipment produced by Vibro-Meter S.A., Fribourg, Switzerland, is shown diagrammatically in Fig. 1, where it will be seen that it bears a general resemblance to the well-known micro-switch, now commonly used on many types of equipment.

It is stated, however, that the design of this switch ensures a repeatability of the order of 0·000072 in. The contact is carried at the end of a 3-element leaf spring, the shape of which can be clearly seen in the plan view. For attachment of the leaf spring to the body of the switch (which has been omitted in the figure for purposes of clarity) a screw passes through a hole at the free end of the central element. At either side of the central element, there is a shorter leaf, which is permanently bowed and is hooked to an anchor point which is arranged to project from the switch body.

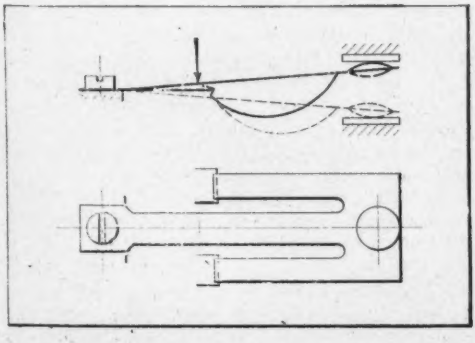


Fig. 1. Diagrammatic views of the 3-element spring and contacts of the ultra-high-precision snap-action switch employed by Vibro-Meter A.G., Switzerland

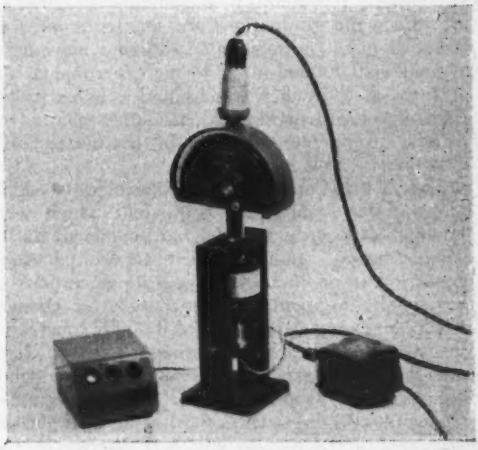


Fig. 2. This special set-up, on a Johannson Optikator comparator, was used to determine the accuracy of repeatability of the Vibro-Meter ultra-high-precision snap-switch

In its " idle " state, the 3-element spring takes up the position shown by the solid line. When pressure is applied to the spring by a suitable push-rod, at the position and in the direction shown by the arrow in Fig. 1, the spring will be deflected continuously until a point is reached at which it changes its position very rapidly to that shown by the dotted line. It is claimed that the time required to complete the change of position is only 1·5 millisec., which is followed by a rebounding period of 3·5 millisec.

ACCURATE REPEATABILITY

Experiments to determine the accuracy of repeatability of the switch were carried out with a special set-up on a Johannson Optikator comparator, and a general view of the equipment is given in Fig. 2. A light ray is used in place of a conventional pointer on this instrument, and the dial is provided with graduations representing movements of 0·000004 in. Since the graduations are spaced at intervals of 0·038 in., it is possible to estimate movements as small as 0·000002 in. For the experiments, the push-rod of the switch was located in line with the anvil of the instrument and the latter was moved axially, to operate the switch, by means of a differential screw and nut.

The switch contacts were connected to signal lamps in the small unit at the left, which were illuminated according to the movements of the 3-element spring. In a series of tests, each of which comprised from 50 to 100 separate operations of the switch, the scatter of the pattern of change-over points was of the order of 0·000072 in.

A typical application of a snap-action switch to provide in-process gauging on a cylindrical grinding machine is shown in Fig. 3. The sensing plunger *A* is in direct contact with the work, at the lower end, and its upper end acts directly on the sliding plunger which actuates the snap switch indicated at *B*.

By providing a number of snap-switches, each set to operate at a different work-size, a complete grinding cycle can be controlled, comprising, for example, coarse feed, a dwell period, to correct errors in circularity, fine feed movement, and dwell for sparking-out the workpiece to the required finished size.

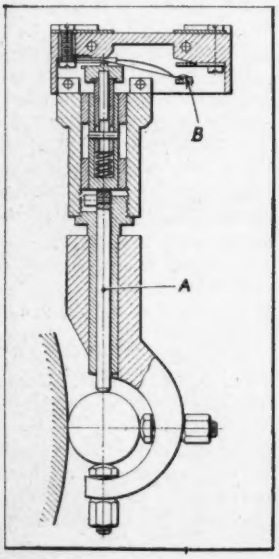
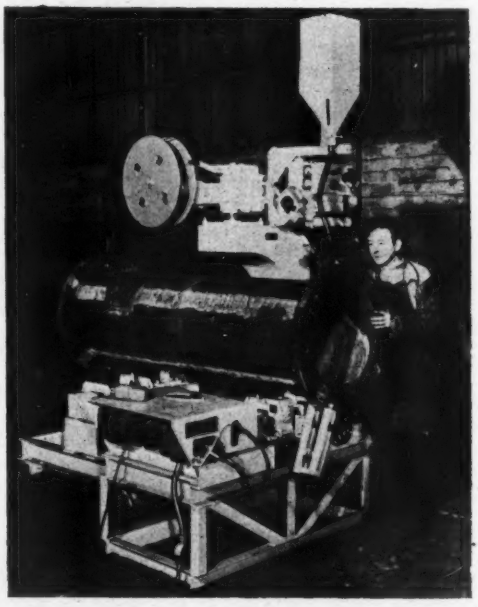


Fig. 3. Typical application of a snap-switch to in-process gauging equipment on a cylindrical grinding machine

Equipment for Welding Pipe Flanges

To facilitate the welding of flanges to the ends of pipes, in a wide range of sizes, Fairfield Shipbuilding & Engineering Co., Ltd., Glasgow, employ the equipment here shown, which incorporates an Autopak submerged-arc welding head made by Rockweld, Ltd., Commerce Way, Croydon, Surrey. This head is supported by a counter-balanced arm, which permits vertical positioning to be carried out with the minimum delay, and it is swivel-mounted for adjustment through an angle of 180 deg. The entire arrangement is carried on a special trolley, whereby it can be rapidly set for performing external or internal welding, and the trolley also supports a flux-recovery unit.



Incorporating a Rockweld Autopak submerged-arc welding head, this equipment provides for external and internal welding operations on pipes

Pipes from 4 to 24 in. diameter are supported close to the front end by a set of power-driven rolls, which provide for rotating the pipe during the welding operation and run in bearings in a floor-mounted frame structure. At the rear end, the work is supported by idler rolls, on a wheeled trolley that can be adjusted along guide rails to suit pipes between 4 and 20 ft. long.

NEW PRODUCTION EQUIPMENT

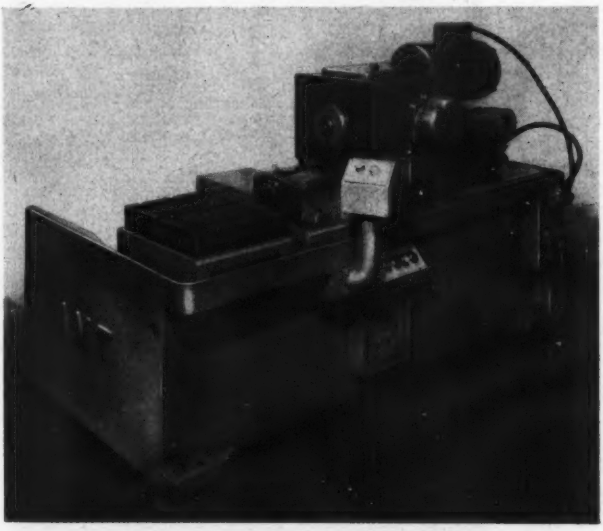
Edited by
G. W. Mason
and
A. J. Barker

A.M.T. Multi-Cycle Unit Head Machine

With the new Multi-Cycle, horizontal-spindle, unit head machine, recently introduced by A.M.T. (B'ham), Ltd., Bristol Road, Bournbrook, Birmingham, 29, different working cycles for drilling, "jump gap" drilling, deep hole drilling with incremental feed, spot-facing or counterboring, and tapping, can be readily obtained by means of interchangeable plug-in units, which are inserted, as required, into a socket in the electric control system. Stops, which are adjustably-mounted on a bar on the base guideway member, are then set for controlling the feed and rapid power traverse motions of the spindle head, and the required spindle speed and feed are selected by pick-off gears housed in the head. Since this arrangement enables the working cycle to be quickly set, the machine can be used to advantage for handling a variety of components in small as well as large batches.

The machine is shown in the figure fitted with the A.M.T. No. 2 size unit head, which has a 5-h.p. motor for the spindle drive, and a working stroke of 12 in. Alternatively, the firm's No. 3 or No. 4 spindle head, which may have a working stroke of 9, 12, or 18 in., and can be provided with a driving motor up to a maximum of 20 h.p., can be supplied. A multi-spindle drilling head, of the fixed or adjustable-centre type, may be mounted on the spindle head casting if required. Full details of the unit heads in the A.M.T. range were given in MACHINERY, 97/682—21/9/60.

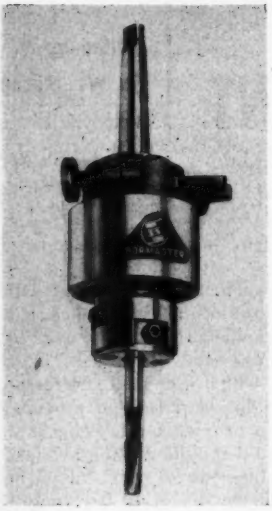
Of fabricated steel construction, the base carries an 18- by 15-in. T-slotted work-table, and houses the electric control equipment, also a timer for controlling the period during which the spindle head is held in contact with a stop—with micrometer adjustment—at the end of the cutting stroke, when spot-facing or counterboring, for instance, is being carried out. A coolant tank and pump are incorporated in the base, and there is a large inclined surface at the rear to facilitate the disposal of swarf. Separate push-buttons are built into a panel on the base for controlling the spindle drive and traversing motions of the head independently, for setting up, and for automatic working there is another pair of push-buttons housed in a separate unit.



On the A.M.T. Multi-Cycle unit head machine, here shown, different working cycles can be readily obtained by means of plug-in units

Bormaster Tapping Attachment

Made by the German firm of Sigloch & Shrieder, the Bormaster tapping attachment, shown in the illustration, is available in three sizes which have capacities for cutting Whitworth threads from $\frac{1}{64}$ to $\frac{1}{16}$, $\frac{1}{32}$ to $\frac{1}{4}$, and $\frac{1}{4}$ to $\frac{3}{4}$ in. diameter. It incorporates planetary gearing, which, in conjunction with the automatic



Sigloch & Shrieder Bormaster tapping attachment

drive - reversing mechanism, gives a speed reduction of 3 to 1 during the tapping stroke, and 1·5 to 1 for the return travel. In consequence, the attachment may be used on drilling machines which have fairly high spindle speeds. The built-in torque control arrangement, of the friction type, is stated to be silent in operation, and it may be adjusted while tapping is in progress, if required.

The smallest attachment in the range has a No. 1 Morse taper shank, and the intermediate size a No. 2 Morse taper shank. A No. 2 or a No. 3 Morse taper shank can be provided for the largest attachment. The diameter of the body is 2¼ in. for the smallest, 2⅝ in. for the intermediate size, and 3$\frac{7}{16}$ in. for the largest attachment. Overall lengths of the bodies and tap holders are 4, 4¾, and 5$\frac{5}{16}$ in., and the weights, 2¾, 3¾, and 4⅞ lb.

A torque arm, fitted with an adjustable forked end piece, which can be brought into engagement with a cylindrical column on a drilling machine, can be provided. Alternatively, the attachment can be prevented from rotating with the spindle of the drilling machine by a vertical rod which engages with a forked portion on the body, and is attached at the upper end to a flanged collar secured to the spindle quill.

Bormaster tapping attachments are sold in this country by Michael S. Thompson, Ltd., 187 Hammersmith Road, London, W.6.

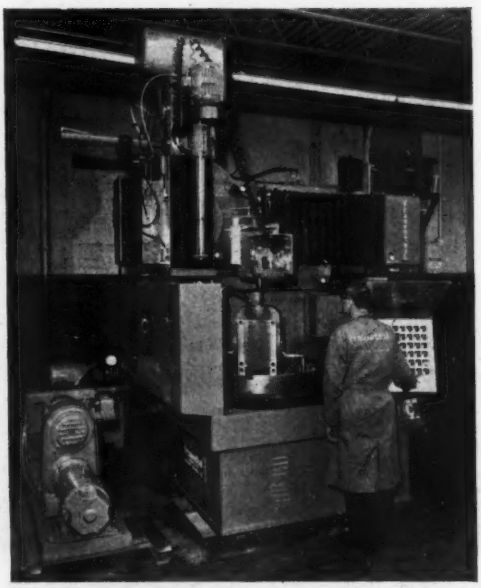
Frauenthal No. 925 Vertical Grinding Machine, with Thread Grinding Equipment

Built by the Frauenthal Division of the Kaydon Engineering Corp., Muskegon, Mich., U.S.A., for whom the agents in this country are Gaston E. Marbaix, Ltd., Devonshire House, Vicarage Crescent, London, S.W.11, the No. 925 vertical spindle grinding machine, here shown, was designed for performing a series of operations on large steel compressor cross-heads, and is equipped for internal thread grinding.

Drive to the 42-in. diameter work-table is taken from a d.c. motor, and there is provision for stepless variation of the speed under potentiometer control. For thread grinding, the table is connected to a recirculating ball lead screw, whereby it is simultaneously rotated and fed vertically for a maximum distance of 12 in. It is claimed that the lead error is less than 0·0005 in. over this distance, and threads of 6, 8, and 12 per in. can be obtained by means of a selector lever. Carried at the lower right-hand side of a saddle, which is mounted on ways on the cross-rail, the separate thread grinding head is adjusted vertically by hand, and can be swivelled to the helix angle of the thread to be cut.

Separate wheel dressing units are provided for the belt-driven thread and main grinding spindles, and the latter is mounted on a swivel slide whereby it may be set to angles up to 45 deg. to the vertical, and clamped by a power-operated system. It has a travel in the axial direction of 36 in., and is reciprocated hydraulically at rates from 9 to 60 ft. per min. The cross-rail can be adjusted for alignment, and the clearance above the table is 40 in.

Contour wheel dressing units can be supplied,



Frauenthal No. 925 vertical grinding machine, with internal thread grinding equipment

also automatic equipment for wheel wear compensation, gauge size control, disengaging feed in the vertical and horizontal directions, electrically, with high accuracy, and controlling the table speed to provide constant cutting speed as the grinding head is fed radially. If desired, the machine can be arranged for grinding under tracer or numerical control.

Attachments for Use with Futurmill Conversion Units

Futurmill Conversions, Ltd., 6/8 The Headrow, Leeds, 1, makers of the Futurmill planer/miller conversion unit, as described in MACHINERY, 94/1156—20/5/59, have recently introduced a right-angle attachment and an Adjustamount attachment.

The right-angle attachment, illustrated in Fig. 1, has a cast Meehanite body which houses two alloy-steel spindles. A B.S. 50 series shank, which registers in the nose of the Futurmill unit, is provided on the driving spindle, and the attachment is secured in position by means of a clamping ring. Four location blocks are provided for accurate location and indexing, and the attachment may thus be set in one of the four positions at 90 deg.

Drive is transmitted through oil-immersed spiral-bevel gears, and the cutter spindle has a B.S. 50 series nose, the cutter being secured in the bore by means of a 1-in. diameter draw bolt.

The Adjustamount attachment, shown in Fig. 2, has been developed for use where the machined area on the front of the tool slide on the planing machine is inadequate for mounting the Futurmill unit. The tool slide is removed and the attachment is secured directly to the front face of the main cross-traversing slide. Either the single or the 2-speed Futurmill unit can be carried on the Adjustamount, which has a vertical movement of 2½ in., the actuating shaft being fitted with micrometer dials graduated in increments of 0·0005 in. Squares are provided on the ends of the shaft to receive a ratchet type handle, and the drive is transmitted through worm gearing to a rotating nut, the screw being fixed in the base member of the attachment.

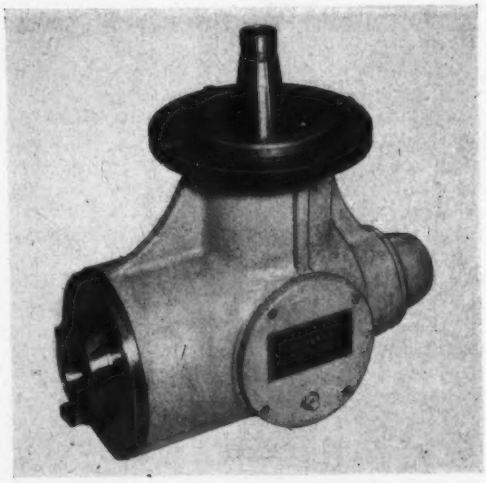


Fig. 1. Right-angle attachment for the Futurmill planer/miller conversion unit

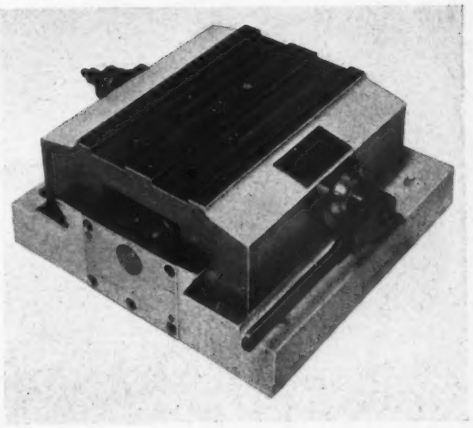
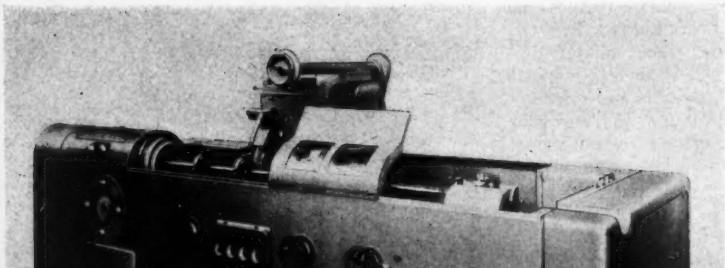


Fig. 2. The Adjustamount attachment for Futurmill units is intended for use where the machined surface on the front of the planing machine tool slide is inadequate for direct mounting

Matrix Type 57-15-90 Thread Grinding Machine

The type 57-15-90 thread grinding machine shown in the figure is one of the largest sizes in the Matrix range built by the Coventry Gauge & Tool Co., Ltd., Fletchamstead Highway, Coventry. Of the travelling wheel-head type, this machine is extensively employed for grinding helical tracks in very long mating screws for ball-circulating nuts. In addition, it finds applications for grinding precision threads and worms in other long, large-diameter components, particularly in the aircraft industry.

Work up to 90 in. long can be held between the work-head and tailstock centres, and threads which have pitches from 0·5 up to 6 in. can be ground



Work up to 90 in. long can be held between the centres on this Matrix type 57-15-90 thread grinder

for a maximum length of 70 in. at a single setting. Longer parts can be passed through the 6-in. diameter bore in the work-head spindle. The work speeds obtainable range from 0·1 to 15·5 r.p.m.

Grinding wheels up to 20 in. diameter may be employed, and single or multiple ribs may be dressed on the peripheries depending upon the nature of the threads to be ground on the work. Drive is taken from a 15-h.p. motor, and high and slow spindle speeds are provided for grinding and wheel dressing. The wheel-head can be tilted through a maximum angle of 45 deg. in each direction for grinding right- and left-hand threads.

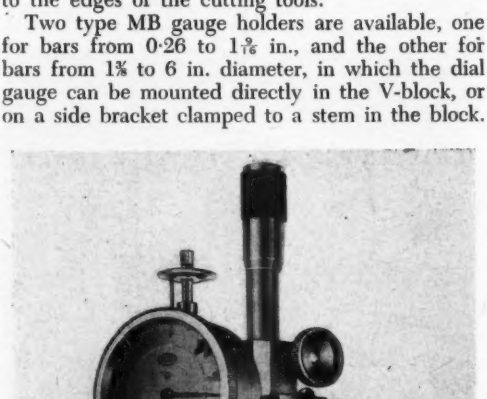
During an automatic working cycle, the wheel-head is advanced towards the work to a pre-set position, and is then traversed for performing the grinding operation. At the end of the grinding stroke, the head is brought clear of the work, and is finally returned under rapid traverse to the starting position. An attachment is available for internal thread grinding operations.

Rockwell Machine Tool Co., Ltd., Welsh Harp, Edgware Road, London, N.W.2, are the sole agents for Matrix thread grinders.

Winter Magnetic Gauge Holders

The West German firm of Ernst Winter & Son, Hamburg 19, have introduced a range of magnetic gauge holders, primarily to facilitate accurate setting of their diamond and tungsten carbide tipped, micrometer - adjustable, tools for boring bars. An example from the range, known as the type MA, is shown in the figure. It is made to suit boring bars from 0·4 to 2⅜ in. and from 1¾ to 4¾ in. diameter. The smaller unit is made in widths of 0·86 and 1½ in., and the larger, in a width of 1¾ in. only. After the V-block has been placed over the boring bar the magnetic grip is obtained by moving a keep plate from the poles. The bracket carrying the dial gauge has vertical micrometer adjustment, and it is recommended that gauge anvils of aluminium or fibre be used to prevent damage to the edges of the cutting tools.

Two type MB gauge holders are available, one for bars from 0·26 to 1⅞ in., and the other for bars from 1⅜ to 6 in. diameter, in which the dial gauge can be mounted directly in the V-block, or on a side bracket clamped to a stem in the block.



Winter type MA magnetic gauge holder for setting boring bar tools

There is also the type MC magnetic holder, incorporating two V-blocks arranged side by side, between which a precision dial gauge reading to 0·001 mm. (0·00004 in.) can be mounted, micrometer adjustment being provided to increase the range. This type MC holder is made in three sizes to suit bars from 0·4 to 6·3 in. diameter.

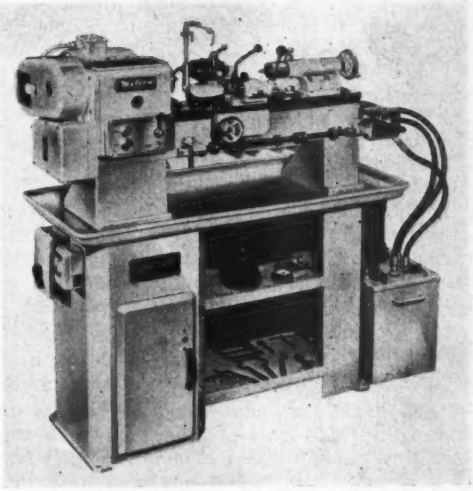
The sole agents in this country for Ernst Winter & Son are M. Hales & Co., Ltd., 73 Devon Street, Saltley, Birmingham, 7.

Myford Mini-Kop Series 1A Copying Lathe

Myford Engineering Co., Ltd., Beeston, Nottingham, have recently added the Mini-Kop series 1A copying lathe to their range. Seen in the accompanying figure, the new machine is intended primarily for repetition turning of forms up to 13¾ in. long with a maximum profile-depth of 1½ in. The lathe will swing diameters up to 7 in. over the induction-hardened bed-ways, and up to 2½ in. over the rear copying and front facing slides.

With an axial travel of 2½ in., the copying slide can be readily set to either of two angular positions with respect to the work axis, and when it is arranged at an angle of 55 deg., maximum angles of 30 deg. and 5 deg. undercut can be reproduced during movement towards and away from the axis, respectively. For copying convex or concave profiles which have a minimum included angle of 60 deg., the slide is set to 90 deg. The tool-holder mounted at the front end of the slide has hand adjustment of 1½ in., along individual ways, by means of a knob which is graduated in divisions of 0·001 in., and the holder can be clamped in position after setting.

The copying slide is hydraulically powered, and advance and withdrawal, to and from the working position, is effected by means of a lever. Copying movements are controlled by a valve of patented design, which is stated to combine high sensitivity with freedom from displacement under load, and it is stated that steps as small as 0·0005 in. can be accurately reproduced. Due to the low pressure which is applied by the replaceable stylus, unhardened masters may be used for work that is required in small quantities, and are normally of cylindrical type. The master is supported between centres on adjustable brackets carried on a bar at the rear of the bed, which can be swivelled, for alignment purposes. Brackets are available, however, to hold flat templates, which are used when copy-turning to the maximum depth of 1½ in. and for face copying. The facing slide has a travel of 1¼ in. by means of a lever, and can be swivelled through 360 deg. It may be removed, for swinging up to 5½ in. diameter over the saddle.



Myford Mini-Kop series 1A copying lathe

Movement of the saddle, which has a traverse of 14¾ in. along the bed-ways, is effected by a hydraulic cylinder mounted close to the bed at the rear, and the arrangement is such that the feed thrust and cutting reaction are virtually in the same plane as the rear shear of the bed, thus reducing wear. Feed rate is steplessly variable from ½ to 60 in. per min., and can be altered while cutting is in progress, to compensate for coarse feed effects when copying steep tapers. Engagement of the feed and rapid traverse—at a rate of 15 ft. per min.—in either direction, is controlled by a single lever. Six adjustable stops are provided on an indexing bar, which extends along the front of the bed. Pressure oil for the hydraulic system is supplied by a self-contained unit, with a ⅓-h.p. motor-driven pump.

Drive to the headstock spindle is taken from a 2-h.p. motor, through a toothed belt, and the standard range of interchangeable pulleys provide for a total of 8 speeds from 500 to 4,085 r.p.m. when the machine is equipped for use on 50-cycle electrical supplies. Bored 0·781-in. diameter, the spindle is mounted at the front end in pre-loaded angular contact ball bearings, and at the rear in a roller bearing. The bearing arrangement is not affected by expansion, and the 4-in. diameter flanged nose is provided with a No. 3 Morse internal taper. The tailstock can be equipped with a barrel that incorporates a live sleeve, which has a No. 1 Morse taper at the nose end and can be traversed axially for a distance of

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2¼ in. In addition, a plain barrel with a No. 2 Morse taper is provided, to permit such operations as drilling, and it can be traversed through 2¾ in. When the plain barrel is used, a maximum length of 16½ in. is obtainable between centres. Movement is applied to the barrel by hand, and the traversing screw is fitted with a ball thrust bearing.

Coolant equipment is provided, and incorporates a ⅛-h.p. motor-driven pump. In addition to holders for flat templates, the range of extra equipment available includes lever-operated collet chucks, a self-centring chuck for mounting on the spindle flange, and a bushed steady bracket.

Ward, Haggas & Smith 2-spindle Horizontal Milling Machine

The 2-spindle horizontal milling machine shown in the figure has recently been built by Ward, Haggas & Smith, Ltd., Keighley, for operations on end frames and other components for textile machines.

There are three bed members, two of which are connected to each other by cross pieces at the right-hand end, and are bolted and tongued to the third —transverse—member at the other end. The left-hand milling head and column can be traversed on the transverse bed member, and the right-hand assembly is mounted on cross guideways on a saddle which can be adjusted on the longitudinal bed members by a 3-h.p. motor, and secured in the required position. Distances up to 102 in. can be obtained between the nose ends of the milling spindles.

A maximum cross traverse of 69 in. is provided for both milling heads, and feeds from 1·5 to 7·5 in. per min., also rapid power traverse, are derived from separate 3-h.p. motors flange-mounted on the ends of the cross bed member and the saddle. Feeds are selected by pick-off gears, and the hand-wheels for cross adjustment of the milling heads are automatically disengaged when power traverse is brought into use. Two work-tables, with 66-by 10-in. T-slotted top surfaces, are provided. One of these tables is carried on the longitudinal bed members, and the other can be adjusted for a short distance, in a direction parallel with the centre lines of the cutter spindles, on extension guideway pieces attached to the left-hand side of the saddle. Slots are provided in the top surfaces of both tables which are in line with each other and parallel with the centre lines of the cutter spindles.

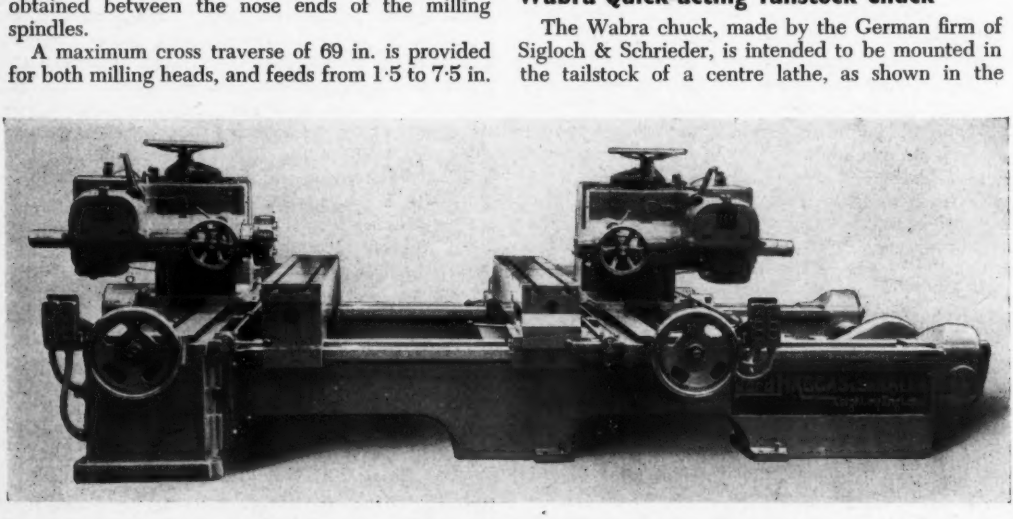
The milling heads can be adjusted vertically on the column ways through a maximum distance of 6 in., and an adjustment of 6 in. is provided for the spindle quills in an axial direction. Mounted in taper roller bearings, the spindles will take cutters up to 10 in. diameter, and have standard milling machine noses. Drive is taken from separate 5-h.p. flange-mounted motors, through pick-off gears and worm gearing, and spindle speeds of 72, 84, 120 and 173 r.p.m. are provided.

Push-buttons for controlling the various motions are built into conveniently-placed panels, and self-winding reels are provided for the cables connected to the milling head motors.

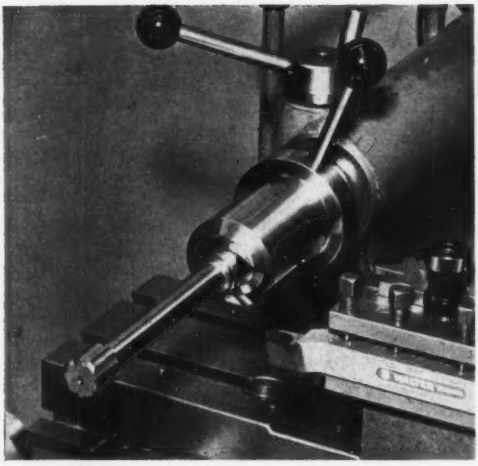
The machine weighs approximately 8½ tons.

Wabra Quick-acting Tailstock Chuck

The Wabra chuck, made by the German firm of Sigloch & Schrieder, is intended to be mounted in the tailstock of a centre lathe, as shown in the



Ward, Haggas & Smith 2-spindle horizontal milling machine



The Wabra chuck, here shown mounted on the tailstock of a centre lathe, enables different cutting tools to be quickly brought into use

figure, and enables different cutting tools to be quickly brought into use, as may be required for performing a number of operations on the work.

With the shank of a twist drill, or other cutting tool which is to be held, inserted in the taper bore of an adapter sleeve, the assembly is loaded into the chuck. For removing a tool from the chuck, an outer sleeve on the body is turned in a direction away from the operator, by means of a ball-ended handle, to bring a slot to the vertical position and into line with a corresponding slot in the body. The cutting tool and adapter sleeve assembly is then lifted vertically clear of the chuck. When a cutting tool and adapter sleeve for the next operation has been lowered into the slots, the outer sleeve is turned in the opposite direction, to the position shown, and cutting can then proceed. This arrangement avoids the need for traversing the tailstock on the bed-ways, and retracting the barrel, for tool changing.

At the nose end of the adapter sleeve there is a flange which engages with a recess in the chuck body. Transverse V-shaped slots are provided in the end face at the rear, which mesh with mating projections on a member built into the chuck, to prevent the adapter sleeve from rotating within the body when cutting is in progress.

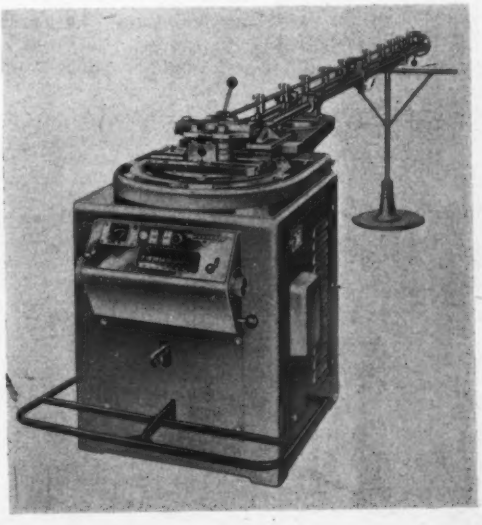
The chuck is available in three sizes which have No. 2, No. 3 and No. 4 Morse taper shanks. Adapter sleeves for use with the chucks have external diameters of 1, $1\frac{3}{16}$, and $1\frac{9}{16}$ in., and are bored to take Morse taper shanks in sizes from No. 1 to No. 4. In addition, sleeves are available which have tapered extensions to take drill chucks. When high torque is to be applied, for example, during heavy-duty drilling, a clamping ring can be provided, which is attached to the nose end of the tailstock barrel and engages a square-section portion at the large-diameter end of the shank on the chuck body, to prevent the latter from turning.

Michael S. Thompson, Ltd., 185 Hammersmith Road, London, W.6, are the distributors in this country for Wabra chucks.

Staffa-Herber SBA 28 Automatic Tube Bending Machine

In the illustration is seen the Staffa-Herber SBA 28 automatic tube bending machine, which is marketed in the United Kingdom and the Commonwealth by Chamberlain Industries, Ltd., Argall Avenue, London, E.10, a member of the Chamberlain Group of Companies. Intended for repetition work, this mandrel-type machine has capacity for bending steel tubes up to 1¼ in. diameter, with wall thicknesses up to 16 s.w.g., and it is stated that output rates of between 500 and 600 bends per hour can be obtained.

On the control panel, provision is made for preselecting operating sequences comprising bends through a maximum of 12 different angles, and the machine incorporates a system whereby right- and



Staffa-Herber SBA 28 automatic tube bending machine

left-hand bends can be made without the need for re-setting. Such bends can be produced successively with no intermediate straight portions, and in certain cases, the arrangements permit bends of different radii to be made without changing the centre former. After the completion of a bending cycle, the forming member returns to its initial position, and the finished workpiece is automatically ejected. Drive for the bending head is taken through a steel disc clutch and oil-bath lubricated worm gearing. There are ten adjustable length stops, which are raised simultaneously to provide for loading a fresh workpiece to the mandrel.

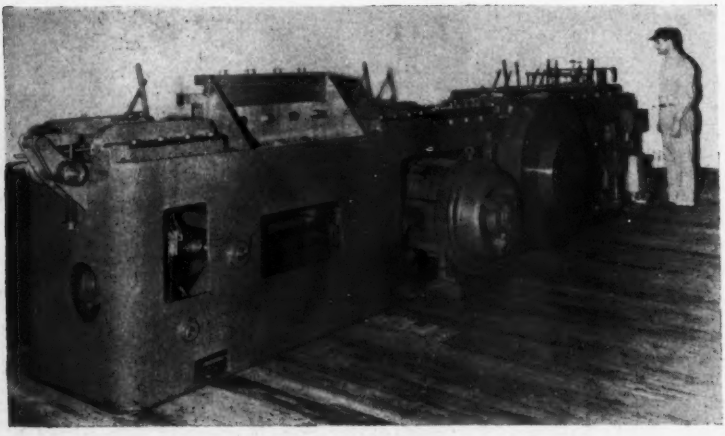
Ajax Drawing and Straightening Machines

George H. Alexander Machinery, Ltd., 82-84 Coleshill Street, Birmingham, 4, are now marketing in the United Kingdom the range of drawing and straightening machines built by The Ajax Manufacturing Co., Cleveland, Ohio, U.S.A., for cold sizing, in a single pass, circular- or hexagonal-section hot-rolled bars, which have been previously pickled and limed or blast-cleaned.

In operation, a bar is drawn through the die by means of two slides, which reciprocate and grip the work alternately. Auxiliary feed slides are provided, to prevent the work from turning as it is passed through the vertical and horizontal straighteners. When loading a fresh bar, the leading end is gripped by an inching slide, which thrusts it through the die, and feeding in this manner is continued until the bar is engaged by the nearest drawing slide. With this arrangement, the need for pointing one end of each bar is avoided, and material is thus saved, and overall operating time reduced.

Built to suit the requirements of the work to be performed, the machines are available in two types, and the continuous drawing and straightening machine shown in the accompanying illustration is intended primarily to prepare bars for feeding to automatic lathes, for example. To indicate the output obtainable, it is stated that when supplied with bars 14 ft. long, and operating at 85 per cent efficiency, a No. 6 machine of this type will handle approximately 29 tons of 1¼-in. diameter bar in an 8-hour day, the drawing speed being 48 ft. per min.

There is also an intermittent drawing, straightening, and cutting-off machine, intended for the production of blanks for such components as steering shafts, drag links, track rod ends, and suspension bars.



Ajax continuous drawing and straightening machine

A VACUUM CASTING INSTALLATION is now in commercial operation at the Rotherham works of Steel, Peech and Tozer, a branch of The United Steel Companies, Ltd., The Mount, Broomhill, Sheffield, 10. It is stated that it enables hydrogen and other gaseous impurities to be rapidly removed from the molten steel, and that ingots cast in this manner are particularly suitable for the production of large forgings and other components which have thick-section forms.

An 11-ft. diameter cylindrical chamber made from ¾-in. thick steel plates, is provided with a removable lid with a water-cooled flange, the vacuum seal being formed by a neoprene rubber gasket. After the ingot moulds have been placed in position, the lid is secured, and the chamber is evacuated by steam ejector pumps to 0·5 mm. mercury. Steel is then teemed through a small opening in the lid at a controlled rate, and as it enters the chamber it is broken up into a fine spray on account of the explosive release of gases. Consequent degasification is very rapid, and the process continues at a slower rate when the steel is in the mould prior to solidification.

It is planned to provide facilities in the future for the vacuum casting of steel in much larger tonnages.

Machine Shop Patents

DRIVING SYSTEM FOR A MULTI-SPINDLE AUTOMATIC

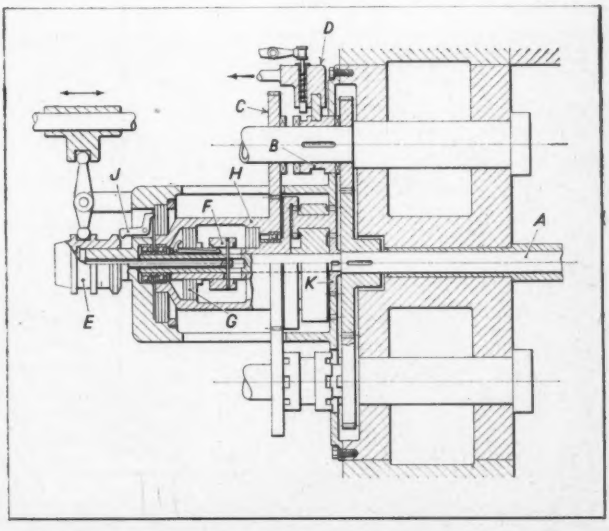
In the accompanying line drawing is shown a driving system for a multi-spindle automatic, of either the bar or chucking type, which enables any spindle to be stopped at a pre-determined angular position. When drive is re-engaged, moreover, the spindle is in the same angular relationship to the other spindles of the machine as before.

Drive is taken from the shaft *A*, and is normally transmitted to each spindle by way of a common gear, a loose pinion, and a dog clutch, as at *B*, which is keyed to the spindle and engages with teeth on the face of the pinion. To stop a spindle, it is disconnected from the transmission by movement of the dog clutch to the left, teeth at the opposite end of the latter being thus brought into engagement with corresponding projections on the face of another loose pinion *C*. This movement is imparted by a sliding member *D*, mounted in ways on the machine frame, which has an arm that engages an annular groove in the body portion of the clutch.

Operation of the mechanism for stopping and re-starting the spindle is controlled by a cam, whereby a slide carried on the machine frame is initially moved into engagement with the outer end of a radially-mounted lever. The inner end of this lever is located between two ribs on the sleeve *E*, at the left-hand end of the main drive shaft. With this arrangement, the sleeve is first moved to the left, and the motion is transmitted by a rod, that extends along an axial bore in the shaft, to the collar *F*. This collar is carried on a sleeve, and is coupled to the rod by a radial pin, which passes through slots in the shaft and the sleeve and thus serves to transmit drive to the latter. A lever, pivotally-mounted in a slot in this sleeve, is thus swung in the clockwise direction, to engage the plate clutch *G* and transmit drive from the sleeve to the housing *H*, which has gear teeth meshing with the loose pinion *C* on the spindle. Rotation of this pinion serves to assist engagement of the dog clutch, mentioned previously.

Next, the sleeve *E* is moved to the right, and during the first stage of this movement the clutch *G* is disengaged. By means of a rib on the sleeve, the lever *J* is then swung in the clockwise direction and operates a multi-plate brake, to stop the spindle. Further movement of the sleeve causes this brake to be released, since the rib passes beyond the end of the operating lever, and, finally, the right-hand end of the collar *F* engages a multi-plate slipping clutch. Drive is thus again transmitted to the spindle through the housing, but is now taken from the main shaft by way of reduction gearing formed by the pinion *K*, planetary gears, and the internally-toothed hub on which the clutch is mounted. In this way, the spindle is slowly rotated, to permit a lever-operated locating plunger to enter a radial hole in the periphery of the dog clutch.

The sequence of operations is reversed to reconnect the spindle to the normal drive, and the design of the teeth at the right-hand end of the dog clutch and on the associated loose pinion is



Sectioned elevation of a driving system, whereby any spindle of a multi-spindle automatic can be stopped at a pre-determined angular position

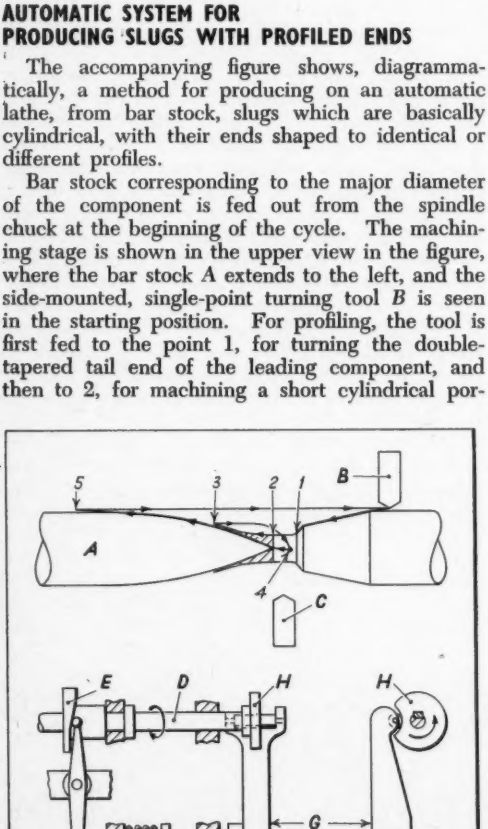
such that they can engage at only one angular position.

864,375. Alfred H. Schutte, Auf dem Sand, Rheinbreitbach/Rhine, Germany, and others. *[Application date June 6, 1957. Published April 6, 1961.]*

AUTOMATIC SYSTEM FOR PRODUCING SLUGS WITH PROFILED ENDS

The accompanying figure shows, diagrammatically, a method for producing on an automatic lathe, from bar stock, slugs which are basically cylindrical, with their ends shaped to identical or different profiles.

Bar stock corresponding to the major diameter of the component is fed out from the spindle chuck at the beginning of the cycle. The machining stage is shown in the upper view in the figure, where the bar stock *A* extends to the left, and the side-mounted, single-point turning tool *B* is seen in the starting position. For profiling, the tool is first fed to the point 1, for turning the double-tapered tail end of the leading component, and then to 2, for machining a short cylindrical portion. Next, it is fed along an inclined path to 3, to rough turn the nose for the next component, and during this stage, the parting tool *C* is fed in to sever the completed part. After completion of the roughing stage, the turning tool is brought clear, and then traversed to the point 4, after which it is fed in an arcuate path to 5, for finish turning the nose profile, and is finally returned to the original position. When the bar is fed forward at the beginning of the next cycle, the profiled nose is located in a steady unit which is provided in the tailstock.



Arrangement for automatically producing, from bar stock, slugs which are profiled to different shapes at the two ends. Longitudinal and oscillating movements are imparted to the pivoted arm *G* by means of the face and edge cams *E* and *H*

In the lower view in the figure are shown front and side elevations of the mechanism whereby profiling movements are imparted to the turning tool. This mechanism incorporates a camshaft *D*, which makes one rev. during each cycle. From the face cam *E*, on this shaft, motion is transmitted through a pivoted arm to move the longitudinal shaft *F* axially.

With this arrangement, movement parallel to the axis of rotation of the work is transmitted to the cross arm *G*, which is secured to the shaft and carries the tool at the lower end. For in-feed movements, this cross arm is pivoted about the axis of the shaft *F*, and it carries a long follower roller which is held by spring tension in contact with the plate cam *H*, also mounted on the camshaft.

No. 860,412. Wilhelm Lauterbach, 20 Cheruskerweg, Wiesbaden, Germany. *[Application date in Germany, October 26, 1956. Published February 1, 1961.]*

IMPROVED ACCURACY IN LENGTH MEASUREMENTS.—It is stated in the Report for 1960, that for the first time the U.S. National Bureau of Standards certified length measurements, made on two commercial gauge blocks, to an accuracy of within one part in five million. The blocks, one 16 in. and the other 18 in. long, were measured by two independent methods, one of which gave the lengths directly in terms of wavelengths of light, and the other in terms of the present U.S. national standard of length, namely a platinum-iridium metre bar.

The results obtained by the two methods agreed to the nearest millionth of an inch for both gauge blocks, and to within two millionths of an inch with measurements made on the same blocks by the National Physical Laboratory in this country. Another gauge block, 4 in. long, was certified to one part in four million, and the agreement for this block with the measurements of two foreign national laboratories was to one millionth of an inch.

Newall-Keighley Type BG Precision Plunge-grinding Machine

DEVELOPED SPECIFICALLY for high-precision plunge-grinding operations on ring and disc-shaped components, the type BG chucking machine shown in Fig. 1 has been introduced recently by The Newall Engineering Co., Ltd., and is distributed by Newall Group Sales, Ltd., Peterborough. It will accept workpieces ranging from 3 to 10 in. diameter, of plain cylindrical or profiled forms, and is equipped with a 20-in. diameter by 2-in. wide grinding wheel which is powered by a 10-h.p. motor. Since it is intended exclusively for plunge-grinding operations, the work-head has only a small amount of manual adjustment—in the longitudinal direction, for setting the work relative to the wheel—and as a result the machine is very compact in design, requiring a floor-space of only 51 by 84 in. Repeatability to a high order of accuracy is claimed, and the need for in-process automatic gauging equipment is thus avoided.

The base member, which is cast in Meehanite, was designed as a result of extensive research by the company's laboratories into vibrations in machine tools, and is said to incorporate various features which increase structural ability and promote rigidity. On the upper surface of the base casting there are hardened and ground steel slide-ways, one of flat and the other of inverted-V form, and these ways are engaged by re-circulating roller bearing units secured to the under-side of the wheel-head. A close-up view of the latter is shown in Fig. 2, where the three re-circulating units for the inverted-V guideway are seen nearer to the camera. These units, also those for the flat slide-way are pressure lubricated from a pump set in the base casting.

Fig. 2 also shows the traverse screw and special nut *A*, whereby the wheel-head is set relative to the workpiece at the start of the cycle. The movements of the wheel-head during the cycle, however, are obtained by means of a special cam mechanism, a close-up view of which is given in Fig. 3. The follower arm *B* is secured to one end of a shaft which is mounted in bearings in the base casting and is arranged at right-angles to the traverse screw. The other end of this shaft carries a heavy-duty cast-iron fork member, on the limbs of which free-running rollers are mounted. Arranged to straddle the nut *A*, Fig. 2, these rollers engage with the slots at the sides, and as the follower arm *B*, Fig. 3, is oscillated by the associated cam, the movement is transmitted to the fork member. As a result, the wheel-head is traversed towards and away from the work, and the shape of the cam provides for rapid approach, fine feed, dwell, initial slow withdrawal, and a final rapid retraction movement.

In the dwell position, the nut *A* is held against

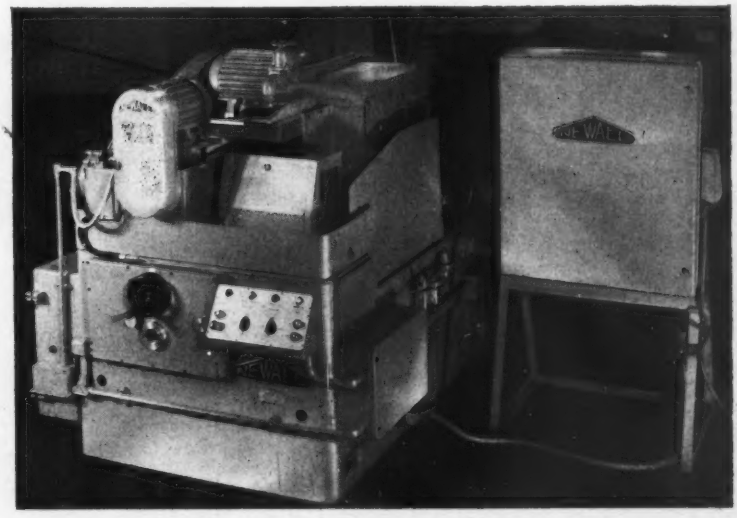


Fig. 1. The Newall-Keighley type BG precision chucking plunge-grinding machine, which has been developed for operations on components such as inner rings for ball and roller bearings

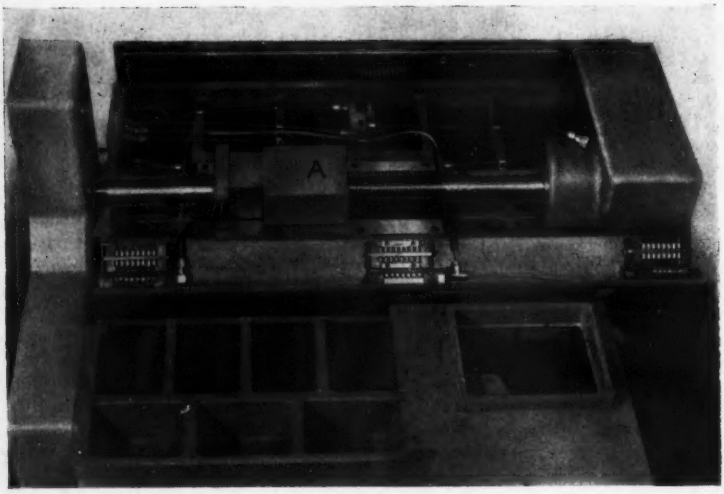


Fig. 2. Close-up view of the under-side of the wheel-head for the type BG machine, showing the re-circulating roller bearing slideway units

accurately ground dead stops secured to the base member. The cam is designed to provide a gradually diminishing feed, and the rate is steplessly variable from 0·01 in. per min. upwards. Cams of different designs can readily be fitted, if required.

The wheel-truing attachment is built into the wheel-head and provides for radius-dressing, as required for plunge-grinding ball tracks in bearing inner races, for example. Arranged to swivel through a maximum of 180 deg. about a vertical axis, the attachment is supported in hardened steel ball-type pivots. For in-feed movement, the attachment is mounted on re-circulating roller units which are pressure lubricated. Coarse and fine setting screws are provided for adjusting the diamond, the latter screw incorporating a dial graduated in divisions of 0·0001 in. A detachable setting gauge is provided to facilitate adjusting the diamond to the required radius for dressing curves.

Speed of angular movement of the diamond, which is swivelled hydraulically, is steplessly variable, and coolant is supplied during dressing. The truing cycle can be started manually, by push-button, or can be initiated automatically after a predetermined number of components, up to a maximum of 32, has been ground. In-feed of the diamond by amounts ranging from 0·0005 to 0·002 in., in 0·0005-in. increments, is applied automatically, as is a compensating movement to the wheel-head to allow for the reduction in diameter of the grinding wheel. The dressing unit is totally enclosed, but easy access is afforded for adjustment or replacement of the diamond. For truing the wheel parallel to the centre-line of the work, a second dressing attachment is available which is arranged for mounting on the work-table.

The work-head has a live spindle and is driven through V-belts by a ¾-h.p. motor. Six speeds, ranging from 25 to 150 r.p.m., are obtainable by means of change pulleys, and adjustment to the belt tension is obtained by means of a screw in the base plate of the driving motor. Mounted in white-metal bearings, the spindle is normally provided with an air-operated chuck and a typical arrangement for holding the inner race of a ball

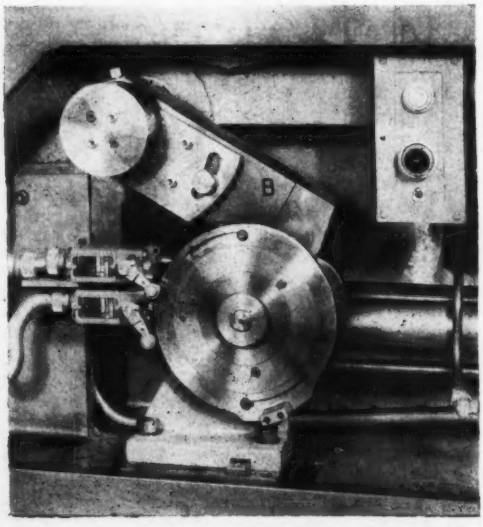


Fig. 3. The automatic grinding cycle is controlled by the hydraulically-operated cam mechanism here shown

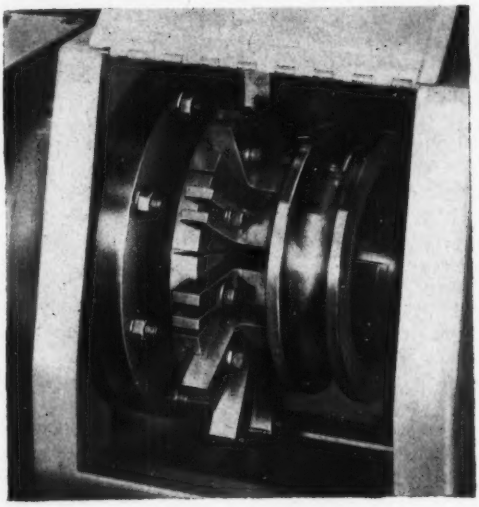


Fig. 4. Typical air-operated chucking arrangement for use when plunge-grinding the track in an inner ring for a ball bearing

bearing is shown in the close-up view Fig. 4. Other types of chucking arrangements can be provided to suit customer's requirements.

The controls are conveniently grouped on the panel seen at the front of the machine in Fig. 1, and all hydraulic and electrical control gear is designed to conform to American J.I.C. standards.

GARDNER AIRMIX POWDER MIXING EQUIPMENT. Wm. Gardner & Sons (Gloucester), Ltd., Bristol Road, Gloucester, have introduced the Airmix range of powder mixing units, which are claimed to ensure very effective mixing by air blast of all types of dry powders, with a total mixing time of less than one minute. These units are made with capacities ranging from 2 cu. ft. up to 800 cu. ft.

An Airmix unit takes the form of a vertical, smooth-surfaced cylinder with a lower conical section containing the mixing head. Instead of blades or agitators, this head incorporates nozzles through which compressed air is fed from a compressor in 1- or 2-sec. blasts, with an interval of a few sec. between the blasts. The injected air imparts a spiral agitating motion to the powder, which results in rapid and thorough mixing. A simple, pre-set electric unit controls mixing time and the intervals between the blasts. Although air is admitted at high pressure, no pressure is built up inside the body.

Montgomerie Reid Ministack Fork-lift Truck

The Ministack battery-operated fork-lift truck shown in the accompanying figure has recently been added to the range made by Montgomerie Reid Engineering Co., Ltd., Bramley, Nr. Basingstoke, Hants. It has a capacity of 15 cwt. at 20 in. load centre from the heel of the fork, or 13 cwt. at 24 in. load centre, and can be supplied for lift heights up to 12 ft.

Of all-steel welded construction, the chassis is a one-piece unit. The telescopic mast assembly is pivoted, and two hydraulic rams provide for 3 deg. forward and 8 deg. backward tilt. Rollers fitted with sealed bearings are provided for the mast and carriage, also steady rollers which can readily be adjusted.

The steering assembly has a full 180 deg. movement, and hydraulic fluid is supplied to the hoist and tilt rams through a sensitive valve which automatically starts a separate pump motor. Rams are chromium plated, and the cylinder bores are honed. Pre-set relief valves protect the hydraulic circuits, and a flow control valve regulates the downward motion of the load.

A heavy-duty traction motor enables gradients up to 1 in 10 to be negotiated, and speeds up to 5 m.p.h. on the level are obtained by means of a pedal-operated multi-step control. Power is provided by a Kathanode traction battery which may range in capacity from 148 to 297 amp.-hours, according to requirements. A Westinghouse wall-mounted charger is supplied.

Hydraulic brakes are fitted to the front wheels, and when the hand brake is applied all controls are switched off. If required, an interlock can be provided which cuts off the control when the driver's weight is removed from the seat. Extra equipment includes fork extensions and crane attachments.

The Montgomerie Reid Ministack fork-lift truck

A Mechanized Moulding Plant

PLANNED TO PROVIDE for a weekly output of between 50 and 60 tons of iron castings, with individual weights ranging from a few ounces to 40 lb., a new mechanized moulding plant has commenced operation recently at the works of R. J. Hunt & Son, Ltd., Lifford Foundry, Birmingham, 30, a subsidiary of J. Brockhouse & Co., Ltd.

Moulds are transported by a closed-circuit pallet conveyor, which is driven through a variable-speed gearbox and a Vulcan fluid coupling, and are produced at a maximum rate of the order of 300 per hour on a battery which comprises one pair of magnetic machines, supplied by Foundry Equipment, Ltd., and three pairs of automatic, air-operated machines, by British Moulding Machine Co., Ltd. One pair of these machines is provided for use in the event of a breakdown. A general view of this battery, from the delivery end of the line, is given in Fig. 1, and it will be seen that individual sand hoppers are arranged directly above the working areas of the machines. During the moulding sequence, the air-operated gates at the mouth of each hopper are opened automatically by the control equipment for the associated machine, to deliver a pre-determined quantity of mould sand.

It may be noted that the line of machines is installed inside the conveyor circuit, and this arrangement facilitates the delivery of cores, which are stored in racks placed against a wall (not shown, but at the left of the illustration) on the opposite side of the conveyor. An operator assembling cores can be seen at the far end of the line.

The completed top half of each mould is assembled, by the operator tending the associated machine, to the lower half which has been previously placed on the conveyor, and the assembly then travels to a position where weights are added, as seen at the lower right in the figure, to prevent lifting when the casting is poured. Ladles of 5 cwt. capacity are employed for pouring, and are suspended from an overhead monorail, which extends parallel with the conveyor for a short distance, also across to the adjacent cupolas. During pouring, which is illustrated in Fig. 2, the operator pushes the ladle along in unison with the movement of the mould. A short tunnel is next traversed, for initial cooling, and after a mould emerges, the weights are removed and placed on a roller conveyor, for return to the position at which they were applied. The mould then enters the main cooling tunnel, from which steam and fumes are extracted by two axial flow fans, driven by 2-h.p. motors.

Fig. 1. A general view of the eight moulding machines which form part of a mechanized plant at the iron foundry of R. J. Hunt & Son, Ltd., Birmingham. Sand is supplied to each machine from an overhead hopper, which is replenished automatically from a belt conveyor

After passing through this tunnel, the mould travels towards two similar knocking-out positions, which are arranged side-by-side, adjacent to the conveyor. One of these positions is shown in Fig. 3, and an air-operated, manually-controlled ram is provided to thrust the mould from the conveyor on to the grid table of a vibratory knocking-out machine. For return to the moulding machines, the box parts are hung

Fig. 2. Molten iron is poured from 5-cwt. ladles, as here shown, which are suspended from an overhead monorail. This track extends parallel with the mould conveyor, for a short distance, and across the shop to the adjacent cupolas

on carriers suspended from an overhead chain conveyor at the left of the operator, and the red-hot castings are loaded into perforated trays, which are moved by a similar conveyor at the operator's right-hand side. In this way, the castings are transported outside the building, where the conveyor forms two loops to provide a total cooling time of 2½ hours.

An extensive sand recovery system is provided, which has an overall capacity of 30 tons per hour, and the moulding machines are mounted on gridded floor panels, through which excess sand falls to an underground conveyor. Sand which falls through the tables of the knocking-out machines is directed to a similar unit, and the material from both sources is discharged on to an inclined conveyor whereby it is raised above the floor level, at the far end of the plant as viewed in Fig. 1. A magnetic overband-type separator is arranged above this conveyor, and the cleaned sand is discharged on to an elevator, whereby it is transferred to a rotary screen and thence to a 150-tons capacity storage hopper. In view of the fluctuating amounts of sand which are handled by this section of the system, the equipment for dealing with the combined quantities has a capacity of 45 to 60 tons per hour.

From the hopper, the sand is transported by two belt conveyors—which are provided with adjustable gates, for controlling the rate of flow, to a Foundry Equipment SB3 continuous mill, where binder and coal dust are added automatically through a pre-set, vane-type dispenser and water is introduced under manual control. New sand is added as required, from a separate hopper. Next, the sand is elevated to a disintegrator, for aeration, and is then discharged on to a belt conveyor, which passes above the hoppers serving the moulding machines and extends for the length of the line. An air-operated adjustable

Fig. 3. One of two stations at which moulds are transferred individually, by an air-operated ram, to the grid table of a vibratory knocking-out machine. Overhead conveyors to the operator's left and right provide for the return of box parts to the moulding machines and for transporting the castings

plough is provided to direct sand from the conveyor into each hopper, and is controlled automatically by means of upper and lower electronic level gauges in the hopper.

The fully-automatic, sequence-interlocked, control equipment for the sand recovery system incorporates thermal overload protection for each stage in the process, and when a failure occurs, all preceding stages are stopped. By-pass and test positions are provided for each stage, for maintenance purposes. A high standard of ventilation has been obtained, and dust and fumes from the knocking-out machines, the inclined conveyor, and the rotary screen are extracted by a 40-h.p. motor-driven fan incorporated in a wet-type arrester located outside the building. Precipitate from this unit is removed by a drag-link conveyor.

Improvements to the melting equipment, which comprises two pairs of cupolas with individual capacities of 6 and 7 tons per hour, have included raising the base-plate of each unit, to provide for the accommodation of a 2-tons capacity receiver, and the installation of Whiting-type water-wash grit arresters.

Pendulum Milling Set-ups

By A. A. HECKMANN*

Reciprocating or pendulum milling, with two fixtures, one of which is loaded while work is in progress on a component in the other, has been employed for many years. Early attempts to apply this technique met with only limited success on account of backlash between the table feed screws and nuts on older machines. Since automatic backlash eliminating arrangements have been incorporated in table drive mechanisms, however, both conventional and climb pendulum milling can be performed without difficulty.

* Cincinnati Milling Machine Co., U.S.A.

A simple set-up for pendulum milling, on a Cincinnati 550-226 HyPowermatic vertical machine, driven by a 50 h.p. motor, is shown in Fig. 1. This machine is employed for milling the flange-mounting faces on gate valves, and will accommodate 26 different sizes of valves, ranging in bore diameter from 2 to 10 in. The fixtures at the ends of the table are provided with hydraulically-operated clamps. Metal removal ranges from $\frac{3}{16}$ to $\frac{5}{16}$ in., depending on the size of the valve, and as an example of the output obtainable, it may be mentioned that 10-in. bore valves can be milled on this machine at the rate of 25 per hr.

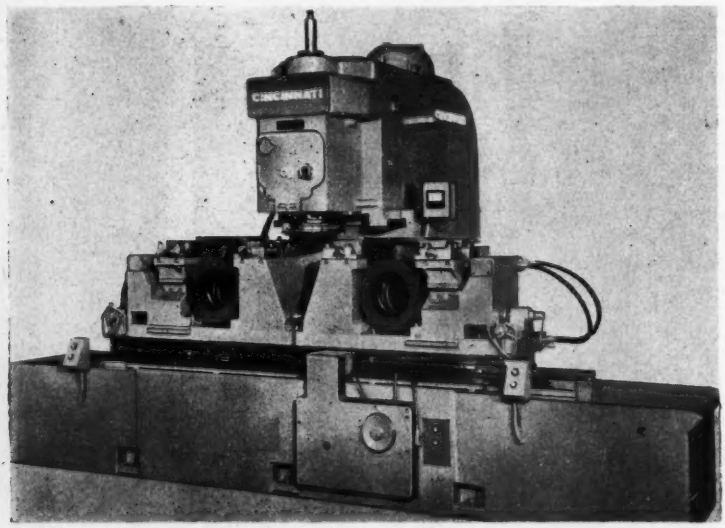


Fig. 1. Pendulum milling set-up on a Cincinnati machine for milling flange faces of gate valves with bores from 2 to 10 in. diameter

Pendulum milling is also being employed with advantage for cutting a small slot in the top of an insulator cap. Single-station work fixtures are provided at each end of the table, and the operation is performed with a vertical milling attachment on a Cincinnati Powermatic machine. The cycle provides for table dwell, after movement to left or right, while the vertical milling head moves down to take the cut. An output of 67 pieces per hour is obtained with this set-up.

It is often possible to employ multi-station fixtures at each end of the table, and an example is shown in Fig. 2. The

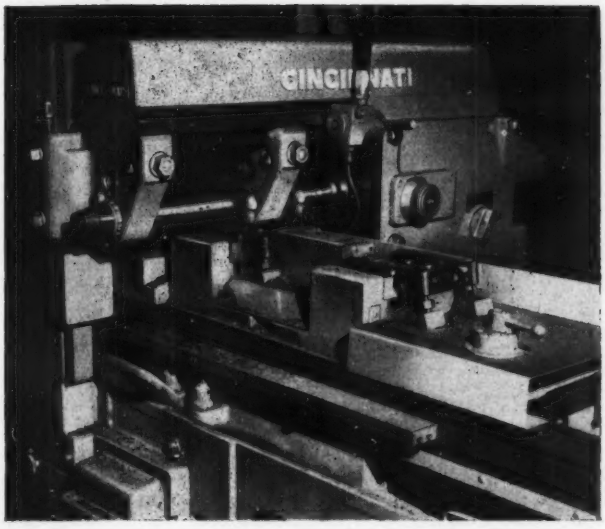


Fig. 2. Cincinnati machine set up for profile milling shot gun frames by the pendulum method

workpieces are shot-gun frame members, which require to be milled with a radius and contour on the bottom face, and the machine is a Cincinnati 100 series Powermatic. To produce the required profile, a rise and fall motion is imparted to the cutter spindle carrier, under the control of a roller which is held in contact, by hydraulic pressure, with cam plates attached to the fixtures. Two workpieces are accommodated in each fixture and an output of 106 per hour is obtained.

Another pendulum milling set-up with a multi-station fixture at each end of the table is shown in Fig. 3. The machine is a 420-266 HyPowermatic, and the workpieces are motor-car stub axles, which are straddle-milled to produce flats on the end bosses. Hydraulic clamping is employed, and milling is carried out at a feed rate of 3 in. per min. over a distance of 1⅞ in. The output obtained is 125 pieces per hour.

A pendulum milling set-up with a 2-station fixture at each end of the table has also been employed for machining zirconium cover plates. The shape of the workpiece was such that mechanical clamps could not be conveniently employed, and the material is non-magnetic. To solve this problem, vacuum chucks were employed. The No. 315-184 Hy-Powermatic machine on which the operation was carried out was equipped for hydraulic tracer control for the vertical movement of the spindle carrier, and this control was employed to obtain the required form in the workpieces.

With the set-up shown in Fig. 4, on a Cincinnati 315-183 HyPowermatic machine, pendulum, indexing, and progressive milling are employed in combination to produce three slots *A* and three slots *B* in a cast-iron transmission housing. In the fixture at *C*, for milling the three slots *A*, the work is clamped on hardened pads by means of a centre bolt and large-diameter plate *D*, and three pads *E* provide support against the pressure of

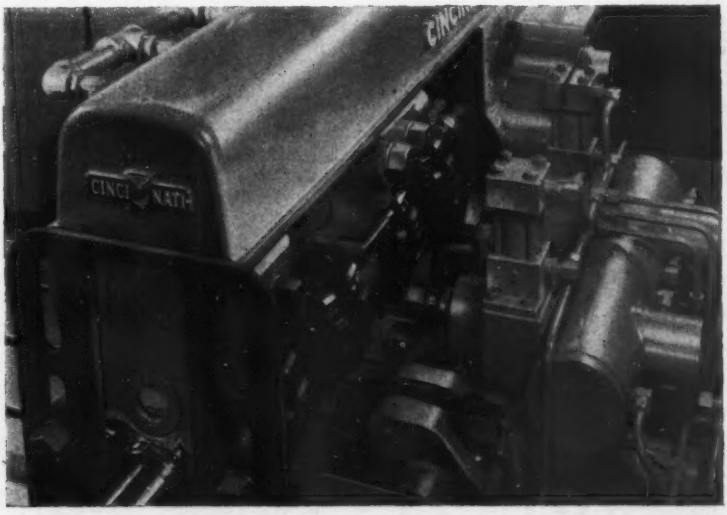


Fig. 3. Multi-station fixtures are provided at each end of the table on this Cincinnati machine for straddle milling flats on motor-car stub axles

Fig. 4. Pendulum, indexing, and progressive milling are combined in this set up for machining two sets of slots, *A* and *B*, in cast-iron transmission housings

the cut. For the next stage, at which the three slots *B* are milled, the work is held by three toe clamps, tightened by spanner. Fixture indexing is effected hydraulically and when the three slots have been milled in each workpiece the table automatically comes to rest. An output of 50 housings per hour is obtained from this set up.

Cutter gangs can also be used effectively in conjunction with pendulum milling cycles in some instances, and attention may be drawn to a set up on a Cincinnati 525-266 Hypowermatic machine for milling the teeth in power hacksaw blades. A 12-in. stack of blade blanks, ranging in length from 14 to 26 in., can be accommodated in each fixture, and a typical production figure, for a 24-in. long by 0·065-in. thick blade, is 368 per hour.

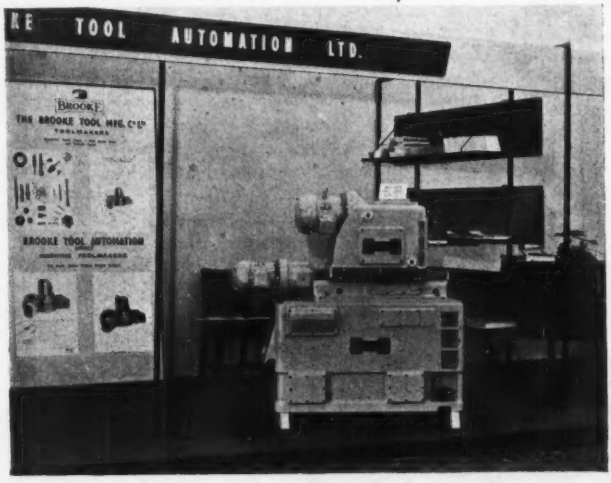
Profile-cutting Large Steel Plates

Flame cutting of profiled steel plates at the works of Ransomes & Rapier, Ltd., Ipswich, is facilitated by the Schichau-Monopol installation here shown. The plates are supported on one or both sides of the divided staging in the foreground, which is covered by opposed booms attached to a console arranged for forward and backward travel along a machined track for a distance of 40 ft. The flame cutting head mounted on each boom has a travel of 10 ft. 6 in., and the two heads can be operated in unison, if required, to produce plates of identical shape or of opposite hand. The travel of the heads and the booms is controlled electronically from the console which contains apparatus for scanning a reduced scale photographic reproduction of a drawing of the work profile. Plates of various thicknesses from $\frac{3}{16}$ in. to 6 in. can be profiled with this equipment, the cutting speed for the thinnest material being 42 in. per min. The work capacity may be increased, if required, by the addition of as many as four slave flame cutting heads.

Schichau-Monopol flame cutting installation at the works of Ransomes & Rapier, Ltd.

Owen Engineering Convention

The Owen Organisation Engineering Convention, held recently in Birmingham, afforded the many guests an opportunity of gaining an insight into the diverse activities of the 42 member firms which comprise the Owen Group. Founded in 1893, when A. E. Owen and J. T. Rubery joined partnership in a small venture concerned with constructional steelwork, the organization has steadily expanded to embrace the resources of specialist firms with products which include ferrous and non-ferrous castings; patterns; pressings; spinnings; weld-fabricated assemblies; nuts and bolts; small link chains; machine tools, unit heads and transfer machines; cutters; chucks; welding machines and electrodes; pressure vessels; racing cars and superchargers; chassis, wheels, axles and suspensions for road vehicles; domestic equipment; earth moving machines and mechanical handling appliances, including fork-lift type trucks; airframe assemblies; precison parts; and a wide range of farm machinery.



(above) The stand of Brooke Tool Automation, Ltd., at the recent Engineering Convention arranged by the Owen Organization

At the Convention the programme of events included displays of earth-moving machines at work and practical demonstrations of Conveyancer platform type and fork-lift trucks. The wide variety of fork-lift truck attachments employed in this connection included a boom designed for transporting open-centred products such as coils of wire; squeeze clamps for lifting bales, boxes and cartons; revolving reel clamps for moving and stacking newsprint and cylindrical packages; carrier forks of tubular construction for lifting crated bottles; and a claw attachment for handling loose loads of logs and pit timbers, for example. Long reach fork-lift trucks, for use in narrow aisles between stacks of goods, and straddle carriers, were also shown.

(right) Exhibits of T.S. Harrison & Sons, Ltd., included a double-ended grinding machine and two centre lathes

Among the stands included in the static exhibition, which was housed in a large marquee, attention may be drawn to those of Brooke Tool Automation, Ltd., Birmingham, and T. S. Harrison & Sons, Ltd., Heckmondwike, here illustrated. The former company displayed a UH 11 electro-mechanical unit head for drilling applications and the latter, a double-ended grinding machine and two centre lathes, one of which was fitted with a hydraulically-operated copying attachment.

A range of twist drills, and various milling cutters, reamers, slitting saws, and drill chucks were displayed by Brooke Tool Manufacturing Co., Ltd., Birmingham, and examples of machine tools, including Boxford centre lathes, a shaping machine, and a tool grinding and lapping machine, by Denfords Engineering Co., Ltd. Gas-shielded welding was demonstrated on the Rowen-Arc stand, and drawn steel cups were shown by the Rubery Owen research and development section.

New Creep Testing Laboratory for E.R.A.

Investigations which have been carried out in connection with the high-temperature properties of steels for steam-driven turbo-alternators for power stations have enabled the working pressure and temperature for such plant to be increased from 600 lb. per sq. in. and 680 deg. F., to 2,000 lb. per sq. in. and 1,050 deg. F., during the past 40 years, and in certain cases, it is stated, improvements in overall operating efficiency ranging from 20 to 34 per cent have resulted.

In the past, creep testing of steels, on behalf of the Electrical Research Association, has been carried out largely by the National Physical Laboratory, Teddington, although in recent years a number of machines have been installed for this purpose at the Cleve Road, Leatherhead, premises of the Association. Because work in this field continues to expand, and it is necessary to carry out many tests for periods exceeding 20,000 hours, also to conduct investigations concerned with special creep-resisting steels, it was decided to establish a separate laboratory at the Leatherhead premises, which would also have the effect of releasing equipment at the N.P.L. for other duties.

The new laboratory, which has a floor area of 9,900 sq. ft., was completed at the end of last year, and has recently been brought into operation. Equipment provided includes 50 high-sensitivity machines, of 2 tons capacity, which are fitted with optical extensometers of N.P.L. design, and are employed principally for carrying out creep tests on steels for rotor forgings. In addition, there are 100 machines of 3 tons capacity, 25 of which are fitted with extensometers of the dial gauge type, and are used for measuring creep properties in thick-wall castings for turbine casings. The remaining machines are employed for rupture tests on heat-resisting steels for the production of pipes and superheater tubes, and each will take either three or ten test pieces, depending upon the length of the cylindrical furnace. Some of the larger-capacity machines are shown in the illustration. The furnace on each machine can be lowered to surround the test pieces, and the temperature is controlled electronically.

A total of 150 machines for carrying out creep and rupture tests on steels for steam-driven turbo-alternators has been installed in the new laboratory of the Electrical Research Association.

Machine Tools at the Soviet Exhibition

By R. E. GREEN, Associate Editor

The Soviet Exhibition, at Earls Court, London, which is to remain open until July 29, covers a very wide field. Among machine tools shown in one of the halls are included a large horizontal borer arranged for digital control of table and spindle head movements and of the diameter bored; a large jig borer; a small 4-spindle fine-boring machine; a large 8-spindle vertical automatic chucking machine; a programme-controlled copying lathe; a horizontal-spindle surface grinder; a generating type gear grinder; and a tool-room lathe.

All these machines are arranged for demonstration, but only the tool-room lathe is set up for the actual production of components. In addition to the machine tools mentioned, exhibits include a double-blow cold-header and a thread-rolling machine of the flat-die type, linked by a conveyor, and arranged for the production of bolts from coiled stock. Several hydraulic type core presses for foundry use are also on view, together with various examples of textile and other machines.

In the hall devoted to science, electronic equipment displayed includes several types of electro-erosion machines and ultrasonic vibration units. Here, and in another article to be published later, some of the machine tool exhibits and other metal-working equipment will be described.

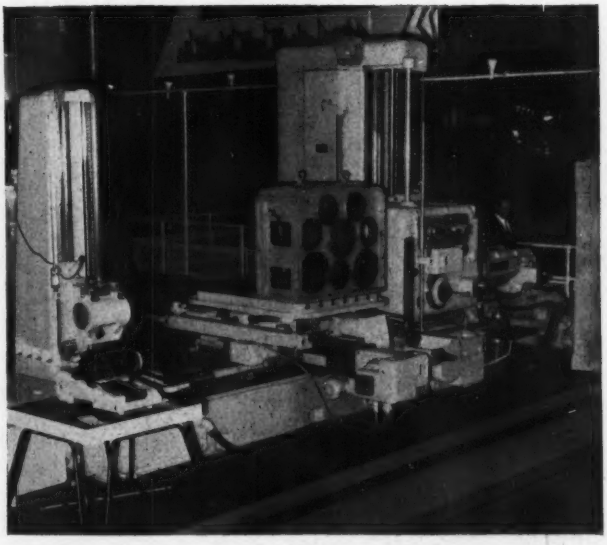


Fig. 1. Of 4·33 in. spindle diameter, this Sverdlova, type 262 PR1, horizontal borer is provided with punched card equipment for digital control of movements of the table in two directions and of the spindle head, also for adjustment of the tool to suit the diameters to be bored

HORIZONTAL BORER WITH DIGITAL PROGRAMME CONTROL

Built by the Sverdlova machine tool plant in Leningrad, the type 262 PR1 horizontal boring machine, shown in Fig. 1, is fitted with digital programme control equipment. It has a spindle diameter of 4·33 in., with a traverse of 28 in. Longitudinal and transverse movements of the table are 39·4 in., and the spindle head has a vertical movement through the same distance. There are 22 spindle speeds from 12·5 to 1,600 r.p.m., and 23 spindle quill and longitudinal table feeds from 0·0022 to 0·315 in. per spindle rev. Transverse feeds available for the table range from 0·055 to 44 in. per min., and all speeds and feeds are selected by means of dials on the spindle head.

The most interesting feature of the machine is the provision of automatic punched card equipment for controlling the longitudinal and transverse movements of the table, the vertical movement of the spindle head, and the diameter setting of the boring tool or facing slide. This equipment comprises four similar units, the unit for transverse table movements being housed in the projection at the front of the saddle, and that for the longitudinal movements, directly beneath the spindle head, as seen in the close-up view, Fig. 2. The unit for vertical movements is housed at the lower right-hand corner of the spindle head, and the fourth unit, for tool setting purposes, is located at the end of the quill housing, and is just visible at the extreme right in Fig. 1.

Details of one of these units, for transverse movements of the table, may be seen in Fig. 3, where the drum which carries the punched card

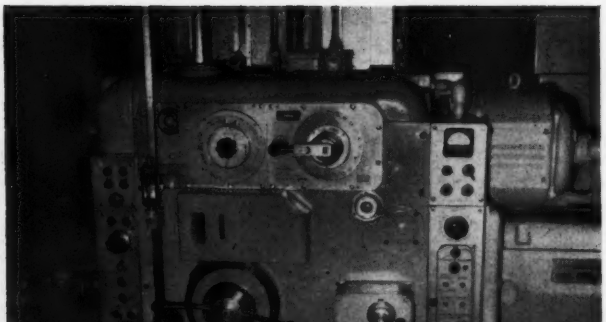


Fig. 2. Close-up view of the spindle head on the Sverdlova machine in Fig. 1, showing the selector dials for spindle speeds and feed rates, and, at the lower right-hand side, one of the punched card control units for vertical movements of the head

is lying on its side at the upper right. Punched cards, of the type in the foreground, measuring 7·35 by 3·25 in., and with space for a maximum of 45 rows of holes, are employed. These cards are first punched with rows of holes corresponding to the successive positions to which each element of the machine is required to be moved during a particular cycle. There is one card for each direction of movement, and one for the tool setting unit, and each card is wrapped round a drum of the form shown in Fig. 3, and secured by a clip. The drum is then inserted in the housing, over a mandrel, and the teeth of an indexing gear at the lower end are thus engaged with other gears in the housing.

For the table movements, the punched card drum units are arranged vertically, and each is provided with a hinged cover—shown raised in Fig. 3—to prevent the ingress of chips and dirt. Each drum has a dial at one end, with markings corresponding to the positions of the holes punched in the card, and when it is inserted, the drum is turned to align the first mark with an index line on the housing face. A switch alongside each drum can be turned to lock it in position and to set the machine for automatic cycle control, or to an alternative position, which provides for manual control.

When the machine is operated under automatic digital control, the successive positions to which the elements are to be moved are calculated, provision being made for the simultaneous movement of all three elements, also of the tool adjustment mechanism, if required. At the start of the cycle, each drum is turned until a row of punched holes is brought into alignment with photoelectric cells which are installed inside the housing.

The cells which are opposite holes in the card complete circuits with electrical relays and other equipment inside the cabinet at the right in Fig. 1, producing a voltage which is proportional to the distance through which the element is to be moved.

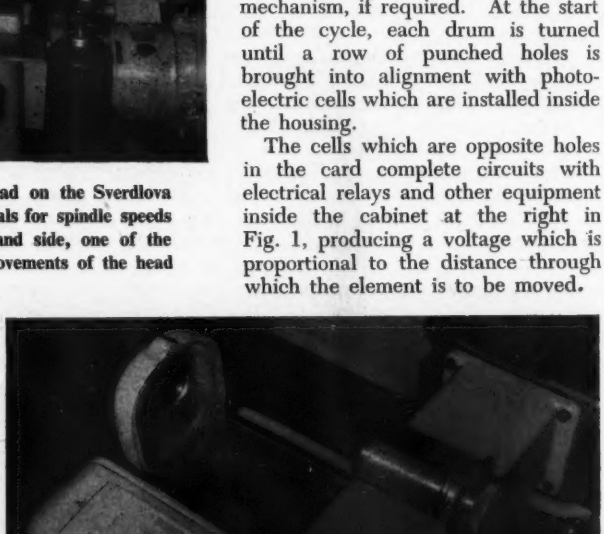


Fig. 3. Cards punched with information corresponding to the required positions of the slides are clipped to drums and inserted into a housing, here shown with the cover raised. This unit controls transverse movements of the table of the machine in Fig. 1

This voltage is employed to control the motor for the desired direction of feed, and the machine element is then moved in this direction. On nearing the specified position, the feed motor speed is reduced so that the final approach is slow, to avoid over-running. It is stated that the accuracy with which the slides on this machine can be positioned is of the order of 0·03 to 0·04 mm. (0·0012 to 0·0016 in.). Adjustments are made to the radial setting of the tool in a similar manner, and a number of boring bars is available to cover any diameter up to 11·8 in. Each bar has a range of adjustment of 0·276 in., or 0·55 in. on the diameter of the bore. If required, a hole can be bored in one wall of a casting, the bar or table advanced to bring the tool close to a second bore, for example, in the opposite wall, the tool adjusted, and the second bore—which may be smaller or larger than the first—machined, all within the automatic cycle.

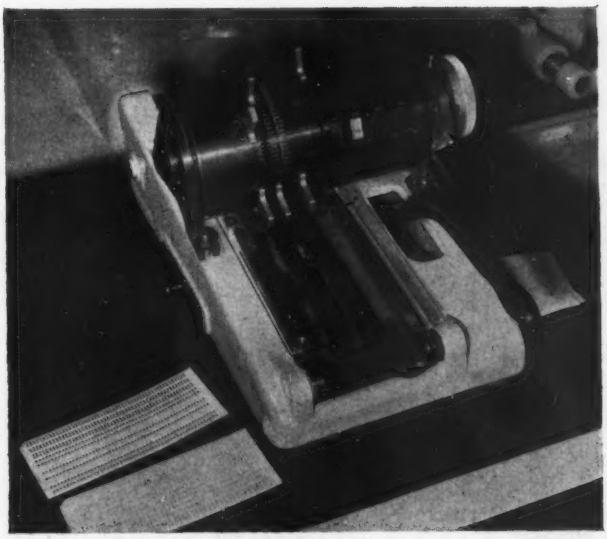


Fig. 4. Close-up view of the card punching unit, also seen at the extreme right in Fig. 1, for preparing the cards to be used on the boring machine. A card, held in a carriage, is indexed by means of a key, and punched by depressing the lever

A punching unit employed for preparing cards for this machine is seen at the extreme left in Fig. 1, standing on a table, and more clearly in Fig. 4. This punch unit has a carriage for the cards, which are accurately located by one short side—this side serving also for subsequent location on the drum. The carriage is spring-loaded towards the front of the unit, and is held stationary by means of a pawl which enters ratchet teeth at one side. Pressure on a key at the lower right allows the carriage to move forward one space at a time. Above the carriage is the punch carrier, and the punches are positioned by means of knurled knobs and drums at the right-hand end, and levers moving in slots.

The levers and drums are set in accordance with the calculations that have been made for a machining position, and the lever at the right is then depressed, to raise a die unit and the card into contact with those punches in the carrier which have been lowered. This action produces holes in the card related to the data supplied, and a complete programme is thus prepared.

JIG BORING MACHINE

Of slightly smaller size than the prototype displayed at the Brussels Exhibition in 1957, the type LP 97 jig boring machine, shown in Fig. 5, is also built by the Sverdlova machine tool plant. This machine has a table size of 39·4 by 63 in., with a 55-in. traverse in the longitudinal direction, and will admit a width of 55 in. between the columns. The vertical spindle head has a traverse of 39·4 in. on the cross-rail, and the rail, also horizontal head at the side, can be moved vertically through 23·6 in. Each head has 18 spindle speeds from 40 to 2,000 r.p.m., and traverse feed rates from 0·0315 to 24·8 in. per min. These feeds can also be applied to the table, and to the spindle quills for boring operations.

A pendant control panel for the machine, as seen close-up in Fig. 6, has a small diagram showing the various moving elements at the upper left-hand side. A selector switch at the centre of the diagram can be turned until an arrow points to a particular machine slide, and a lamp on that element on the diagram is then illuminated to show which circuit has been completed. Movements are subsequently obtained by means of a common set of push-buttons and other controls.

Spindle speeds are selected from a dial beneath the diagram, which is turned to align a pointer with the value required. At the upper right-hand side of the panel there is a selector switch that

Fig. 5. Also built by the Sverdlova plant in Leningrad, this type LP 97 jig borer is provided with steel scales for positioning, which are engraved with 1-mm. divisions, and are read to an accuracy of 0·002 mm. (0·00008 in.) by means of an optical system. The magnified images of the scale lines are projected on screens

can be turned to bring a pointer opposite any of the 32 feed rates marked on the surrounding dial, and the feed is then automatically engaged. Feed motions are powered by d.c. motors of 3·75 h.p., supplied from a Ward-Leonard set, and for positioning the table and spindle heads, and raising and lowering the cross-rail, movements are controlled by a tilting motion of the selector switch.

The positioning system of the machine is based on flat steel scales, engraved with lines at intervals of 1 mm. (0·0394 in.), which are viewed at a magnification of 120 ×, through optical systems whereby the images are projected on screens on the bed, cross-rail, and horizontal spindle head. External scales, engraved with 1-mm. divisions, and numbers, are provided for approximate positioning, and the final settings are then obtained with the aid of vernier scales on the glass screens. Each screen is marked with a pattern of lines arranged at a slight angle with the image of the scale line (angular lines), and these lines are divided into 10 by further lines at right angles to the scale image (dividing lines).

Readings are made by examining the position of the scale line image in relation to the angular lines, which gives divisions of 0·1 mm. The angular line crossed by the scale image line is then examined, and the number of dividing lines from one edge of the screen to the point where the image crosses the angular line, is counted to obtain divisions of 0·01 mm. Finally, the spaces between the dividing lines, along the angular lines, are sub-divided into five by series of dots, and by counting these dots the position

(*Continued on page* 172)

Fig. 6. Control of speeds and feeds on the LP 97 jig borer is centralized on this pendant panel, which has provision for power adjustment in the vertical direction, and can be swung to any convenient position

Gilman and Burgmaster Machines

Kearney & Trecker-C.V.A., Ltd., Portland Road, Hove, Sussex, have recently concluded agreements relating to the sale, in the United Kingdom, of Transferline and Indexomatic automatic assembly machines built by Gilman Engineering & Manufacturing Co., Janesville, Wis., U.S.A., also for the sale, in Europe and the British Commonwealth (excluding Canada), of the range of Burgmaster hand-controlled, automatic-hydraulic, and tape-controlled turret drilling machines built by the Burgmaster Corporation, Gardena, Calif., U.S.A.

Gilman automatic machines are now being used for assembly of an extensive variety of units in the U.S.A., and the company has specialized in this field since 1948. Transferline machines, which are intended for assemblies that require a large number of operations, are of "in line" type, and the work is built-up on platen-type jigs, which are moved from station to station. Machines of this type lend themselves readily to modification or the addition of extra stations to allow for design changes. Indexomatic machines are of rotary indexing table design and are more suitable for assemblies which only require a small number of operations.

Both types of machines incorporate standardized elements and mechanisms. Transferline machines, for example, are built on standard bed units which can accommodate up to 24 stations. A standard power-feed unit is mounted at one end and imparts motion to the transfer bars for the platen-jigs by means of a bell cam. The standard actuating mechanism for the slide at each work station is also cam operated, through a chain and sprocket system which gives a 2:1 mechanical advantage. An air cylinder is incorporated which serves to hold the follower lever in contact with the cam, and forms a safety arrangement in the event of the slide jamming.

Gilman Indexomatic machines are available with tables up to 60 in. diameter, and the standardized indexing mechanism provides for angular movements down to 22½ deg. This mechanism is drum-cam actuated, and is so arranged that indexing takes place during the first 90 deg. of cam rotation, the table being held positively during the remaining 270 deg. of rotation.

Among Gilman machines which are now in operation, may be mentioned a 16-station unit for the assembly of the cap and retracting mechanism of a ball pen. This machine has made available 17 operators and 600 sq. ft. of floor space for other work, and has an output of 2,880 assemblies per hour. A 10-station and a 24-station machine, connected by work-transfer arrangements, have been built for assembling potentiometers, which may be of 27,648 different types, at rates exceeding 1,600 per hour. Machines have also been constructed for assembling, for example, commutators (218 per hour), distributor shafts (1,200 per hour), and shock absorbers (1,300 per hour). It is proposed to describe some of these machines in a subsequent issue of MACHINERY. In addition to designing and building complete machines, the Gilman company are prepared to sell their standardized machine elements to firms who wish to construct their own automatic equipment for assembly operations.

Burgmaster turret drilling machines will be supplied by Kearney & Trecker-C.V.A., Ltd., fitted with British electrical equipment and the Ferranti co-ordinate positioning system. This system is fully transistorized and is powered by 12-volt batteries which are continuously charged from the power mains. Information is fed into the system by dials or punched paper tape, and positioning is checked by Ferranti moiré fringe arrangements, which have already been described in MACHINERY.

A variety of Burgmaster machines is now available, of single- and double-column designs. Type 2 BHT has capacity for drilling ¾ in. diameter in steel, with 8-in. turret travel, and table traverses of 10 and 18 in., 15 and 26 in., or 20 and 30 in. Type 25 AHT has capacity for drilling 1¼ in. diameter in steel, with 10-in. turret travel, and table traverses of 15 and 26 in., 20 and 30 in., or 30 and 45 in. Both these machines are of single-column type, and have 6-station turrets. Also of single-column design, the type 3 BHT has an 8-station turret, and capacity for drilling 1½ in. diameter in steel, with 12 in. turret travel. The table traverses for this machine are 20 and 30 in. or 30 and 45 in. The double-column 3 BHT-B machine is of similar capacity, and is available with table traverses of 48 and 60 in. All these machines are tape controlled. Machines of similar design, designated types 2 BH and 3 BH, are available without tape control but with hydraulically-powered feed motions.

Kearney & Trecker-C.V.A., Ltd., will hold stocks of essential spare parts for the machines, and components for the hydraulic and electrical systems are already available in this country.

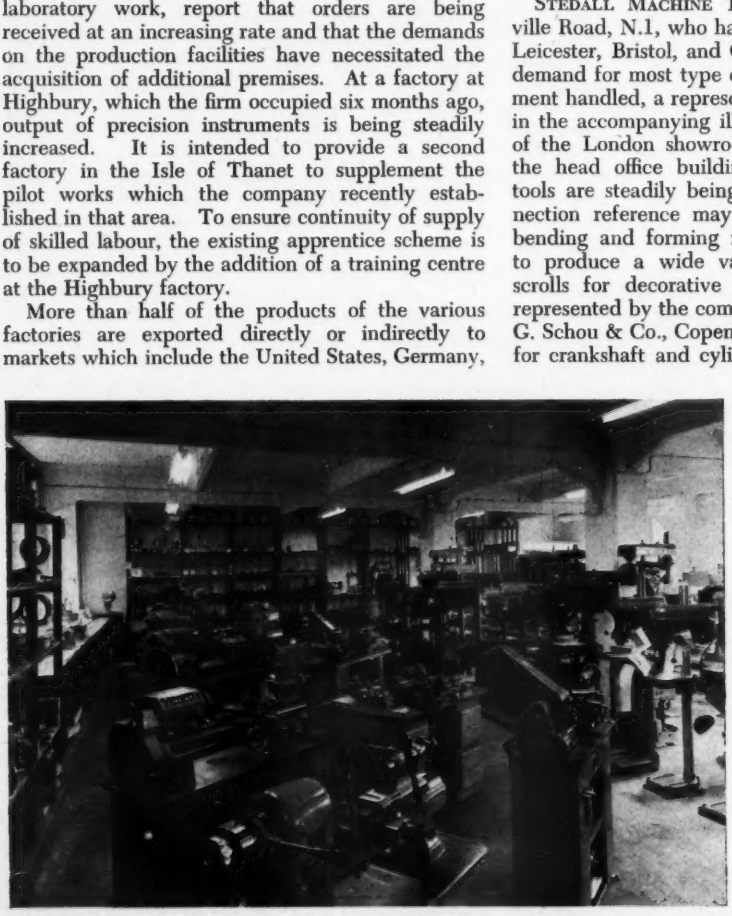
NEWS OF THE INDUSTRY

London and the South

HILGER & WATTS, LTD., 98 St. Pancras Way, Camden Road, N.W.1, who produce a comprehensive range of engineers' measuring and inspection equipment, and specialized instruments for laboratory work, report that orders are being received at an increasing rate and that the demands on the production facilities have necessitated the acquisition of additional premises. At a factory at Highbury, which the firm occupied six months ago, output of precision instruments is being steadily increased. It is intended to provide a second factory in the Isle of Thanet to supplement the pilot works which the company recently established in that area. To ensure continuity of supply of skilled labour, the existing apprentice scheme is to be expanded by the addition of a training centre at the Highbury factory.

More than half of the products of the various factories are exported directly or indirectly to markets which include the United States, Germany, China, and Russia. Interesting work recently undertaken by the company has included the production of surveying and other instruments required for positioning the circular array of 336 magnet sectors, each of 20 tons weight, for the Nimrod proton synchrotron at Harwell.

STEDALL MACHINE TOOL CO., 192-204 Pentonville Road, N.1, who have branches at Manchester, Leicester, Bristol, and Glasgow, report a sustained demand for most type of machine tools and equipment handled, a representative selection being seen in the accompanying illustration which shows part of the London showroom on one of the floors of the head office building. Agencies for machine tools are steadily being acquired and in this connection reference may be made to the Iscot bar bending and forming machine which is designed to produce a wide variety of shapes, including scrolls for decorative ironwork. European firms represented by the company in this country include G. Schou & Co., Copenhagen, builders of machines for crankshaft and cylinder block surface grinding and cylinder honing; also Herbert Lindner, Berlin, the well known makers of jig boring and thread grinding machines.



A view in the showroom at the London premises of Stedall Machine Tool Co.

J. M. HARGREAVE & CO., LTD., Central Avenue, West Molesey, Surrey, are working extra shifts to keep pace with the volume of work that is being received for heat treatment. Parts are collected and delivered over a wide area and the range of heat treatments undertaken includes martempering, carburizing, nitriding, and annealing. I.C.I. salt bath furnaces and an electrically heated tempering furnace are installed, the

latter being employed extensively for stress relieving light alloy castings. Another section of the works is concerned with the production of precision parts to A.I.D. standards from high tensile and stainless steels. In addition, there are facilities for repetition work.

A steady demand is reported for the types K and J3 Hargreave flameproof hand inspection lamps. The former is provided with a low wattage fluorescent tube, and the latter with a 25-watt filament bulb, and for both, officially recognized flameproof certificates have been granted.

Testing department at the works of Bader Machinery Co., Ltd., Hersham Trading Estate, Surrey

BEARD & FITCH, LTD., are now well established in their new works at Edinburgh Way, Harlow, Essex, to which they moved from the original premises (now closed) at Britton Street, London, E.C.1. This company was founded in 1851 for the purpose of making wheels for clocks, and since that date the range of work undertaken has been progressively widened to cover, for example, the production of spiral bevels and mating pinions, single and multi-start worm and wormwheel assemblies, helical gears, racks, pinions, internal spur gears, sprockets, and traversing screws.

One of the latest machine tools installed is a TOS type 10 gear hobbing machine which will produce gears up to 60 in. diameter by 2 d.p. Other equipment in the works includes bevel gear generating machines by Gleason and Heidenreich & Harbeck, gear shaping machines by Fellows, Lorenz, Drummond Bros., and Sykes, hobbing machines by Pfauter and Mikron, a hob grinding machine by Klingelnberg, and a range of centre lathes and milling machines. There is also a fully-equipped inspection room.

BADER MACHINERY CO., LTD., Hersham Factory Estate, Walton-on-Thames, Surrey, specialize in the design and construction of automatic equipment employed in the manufacture of semiconductors, incandescent lamps, radio valves, cathode ray tubes, and fluorescent tubes. Among the interesting projects undertaken recently was the production of a group of 18 machines designed for the manufacture of miniature glass-encapsulated germanium-silicon diodes. Various standard machines are offered for diode manufacture, which enable outputs of 1,500 to 1,800 per hour to be obtained. Soft or hard glass may be employed, with a wide variety of beaded or slugged lead-wires and "whisker" sub-assemblies.

Such machines, also lamp making machinery, are in strong demand, and it is stated that approximately 80 per cent of the orders booked are for export. The company's principal factory at Hersham, and the branch factories at Rainham, Kent, and Bedford, are at present fully occupied. A view of the testing department at Hersham, in which several completed machines can be seen, is given in the accompanying illustration.

F. W. HERRIDGE.

Huddersfield and District

HOPKINSONS, LTD., Huddersfield, are occupied with the manufacture of various types of valves including a range for use in power stations, for which there is a heavy demand both from the home market and numerous countries overseas. The oil purifying department is maintaining a good production of a wide range of separator units, a number at present in progress being intended for the purification of lubricating and cutting oils.

A steady output of steel castings from the foundry is reported, a large proportion of which is required for the company's products, although a certain amount of work is undertaken for a number of engineering companies in the district.

FRED HARDY (HUDDERSFIELD), LTD., Folly Hall, Huddersfield, inform us that their foundry, which is equipped for the production of iron castings with individual weights up to 10 tons, is busy on machine tool and other work. At present the average weekly output is of the order of 40 tons.

KERSHAWS ENGINEERS (HUDDERSFIELD), LTD., report an increasing call for their services as contract machinists from a number of machine tool makers in the area. It was noted that there is capacity for planing up to 20 ft. long by 5 ft. wide, and for turning work up to 18 ft. long, also up to 12 ft. diameter by 3 ft. wide.

Other products of the company include fabricated structures up to 5 tons weight, and the general pattern making department is at present busy with a large amount of machine tool work.

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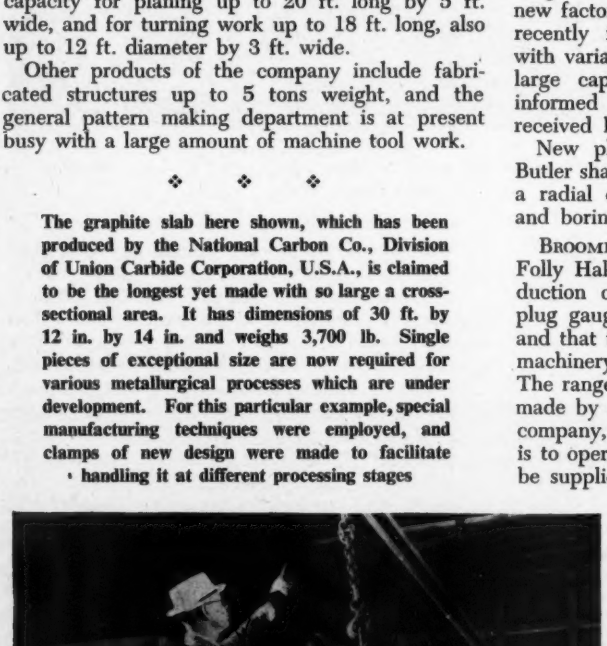
The graphite slab here shown, which has been produced by the National Carbon Co., Division of Union Carbide Corporation, U.S.A., is claimed to be the longest yet made with so large a cross-sectional area. It has dimensions of 30 ft. by 12 in. by 14 in. and weighs 3,700 lb. Single pieces of exceptional size are now required for various metallurgical processes which are under development. For this particular example, special manufacturing techniques were employed, and clamps of new design were made to facilitate handling it at different processing stages



THOMAS BROADBENT & SONS, LTD., Huddersfield, report a good demand for their range of products which includes centrifugal clutches, couplings, brakes, and centrifugal extraction machinery for the sugar, chemical, and laundry industries.

A large number of sugar centrifugals is at present in course of production in the works, and a good percentage of this equipment is destined for export to various countries. The volume of orders for laundry extractors has been steadily increasing recently and a works extension has been built to enable output to be increased.

The recently formed subsidiary, Broadbent-Versatile, Ltd., has now started production of a range of dry-cleaning plant and equipment in a new factory of some 19,000 sq. ft. This company recently introduced a new chemical centrifuge with variable speed drive by hydraulic motor and large capacity bottom discharge, and we are informed that the number of enquiries so far received has been quite satisfactory.

New plant installed in the works includes a Butler shaping machine, a vertical milling machine, a radial drill, and a Broadbent vertical turning and boring mill.

BROOMFIELD ENGINEERING COMPANY, LTD., Folly Hall, Huddersfield, inform us that the production of their range of "go" and "not-go" plug gauges is being maintained at a high level and that the volume of orders for special purpose machinery and jigs and fixtures is satisfactory. The range of solid tungsten carbide slip-gauge sets made by this firm is in keen demand, and a new company, Rentagage, Ltd., has been formed, which is to operate a service whereby sets of gauges can be supplied on rental for three years with option to purchase at the end of the period. We hope to publish fuller details of this scheme in a future issue of MACHINERY. New plant recently installed includes a Polish Giewont universal milling machine.

N. C. ASHTON, LTD., St. Andrews Road, Huddersfield, makers of aluminium-bronze ingots, billets, forgings, and plate, report an increasing demand for their products. Recent developments by this company include an aluminium-bronze welding wire, and we are informed that a technical advice service is maintained for the benefit of fabricators concerned with the welding of aluminium-bronze assemblies.

Another new product is "Narglas-

A " alloy for glass moulds. It is stated that molten glass will not adhere to the surface of the mould, and that the alloy is not subject to heat growth or cracking, and has high heat conductivity.

The company recently produced two aluminium-bronze slabs each weighing more than 5 tons. These slabs were produced for a customer in the United Kingdom but after being machined they will be shipped to the Continent.

DATHAN TOOL & GAUGE CO., LTD., Thornfield Works, Thornfield Lane, Lockwood, Nr. Huddersfield, report an increase in the volume of orders and enquiries for their range of vernier height gauges and gear tooth verniers. We are informed that the gear shaper cutters and straight bevel generating cutters which this company produces are in heavy demand, and that to meet the increasing production requirements a number of new machine tools has been installed including a profile grinder for gear shaper cutters, a Jones & Shipman surface grinder, and a Cincinnati No. 2 universal milling machine. A considerable proportion of this company's present production is for export to France, India and Jordan, approximately 10 per cent of the monthly output being now regularly consigned to France alone.

PLANERS (HUDDERSFIELD), LTD., Lockwood, are busy with the production of their range of both double column and open-side type planing machines. We are informed that there has been a substantial increase in the volume of orders for machines fitted with milling heads during recent months, and it is stated that the volume of enquiries which is being received at present has reached a record level, and that a large percentage relates to machines with special features.

R. SUTCLIFFE.

Spen Valley

THE CRESCENT ENGINEERING CO., LTD., High Town, Liversedge, inform us that their works are fully occupied with contract machining work for various companies engaged in the production of machine tools, valves, and hydraulic equipment. This company also builds the Finney tap sharpening machine, and we noted that in addition to a number of the standard design, a machine with an elevating head is at present under construction, for export to Brazil.

We are informed that an order has recently been received for the production of two automatic carton forming and gumming machines for the confectionery trade.

WM. HARDILL, SONS & CO., LTD., Netherfield Ironworks, Cleckheaton, makers of woodworking machinery, including band saws, planing machines and saw benches, report a steady demand for all the machines in their range. Other activities of the company include the manufacture of conveyor drums and pulleys in cast iron, wrought iron, and fabricated steel, which are in keen request at the present. The foundry is maintaining a high output of castings by both floor moulding and machine moulding, ranging up to 1 ton unit weight, for a number of machine tool companies in the district.

TOM SENIOR (LIVERSEDGE), LTD., Atlas Works, High Town, Liversedge, report a sustained flow of orders from both the home and export markets for their range of milling machines and auxiliary equipment. A programme of re-design and development of the company's products is at

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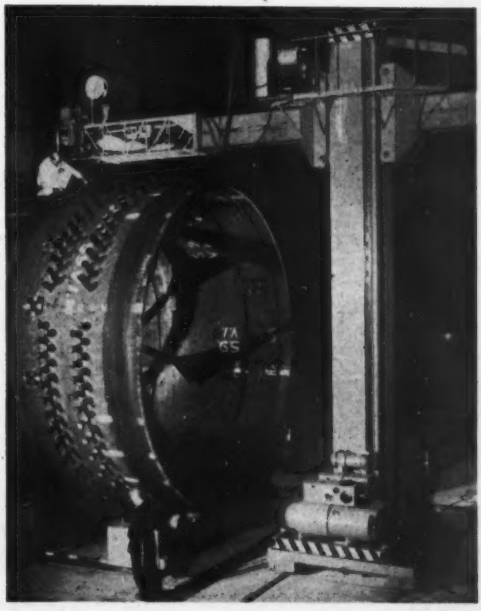
Twelve 350-ton heat exchangers for the nuclear power station which is now being built by Atomic Power Construction, Ltd., at Trawsfynydd, North Wales, are being fabricated on site by International Combustion, Ltd., Derby, with the aid of manipulating equipment and welding columns supplied by Yates Plant, Ltd., Bedewell Works, Hebburn on Tyne. Two columns with retractable booms of 30-ft. reach have been provided, and the operator has central finger tip control



present in hand, and we hope to publish particulars at a later date.

T. S. HARRISON & SONS, LTD., Union Street, Heckmondwike, are experiencing an increasing call for all the machines in their range which include profiling lathes; milling machines; standard centre lathes; pedestal type grinding machines, and woodturning lathes. Recent orders have included one for 24 lathes for a new technical college in Lancashire, and we are informed that export trade is at present very brisk, and that orders are in hand for Germany, Canada and the U.S.A.

To meet the increasing demand, a major expansion scheme for both plant and building has been started. This scheme covers an extension to the works of some 20,000 sq. ft. which is at present in course of erection and the following machine tools have been installed since our last visit:—a Newall internal grinding machine, an Archdale radial drill, and a Herbert No. 2D punched-card operated turret lathe with automatic bar feed.

The associated firm, Denfords Engineering Co., Ltd., Union Street, Heckmondwike, are busy with the production of lathes; drilling machines; tool and cutter grinding machines; shaping machines; and carbide lapping machines, and are well placed for orders for all these products. New equipment recently installed in the factory includes a Herbert No. 5 Preoptive turret lathe and an Edgwick keyway milling machine.

Products of the company were shown at the 1961 ASTME Tool Exposition in New York, U.S.A., and the following are to be exhibited in Brussels in September: a standard type and an automatic cycle milling machine; a standard 12-in. swing lathe and a 12-in. swing profiling lathe; a 9-in. swing lathe; a tool and cutter grinding machine; a carbide lapping and chip breaker grinding machine; a number of Boxford lathes; and a Boxford shaper.

R.J.H. TOOL & EQUIPMENT CO., LTD. Heckmondwike, report a continued increase in the volume of orders for their range of pedestal grinders, back-stand grinders, polishing machines, and belt grinders. A considerable proportion of current production is for export, and we may note that a large contract from Canada for pedestal grinders, and a number of orders from India for band facing machines, are at present in hand.

R. SUTCLIFFE.

ELECTRICITY GENERATION CAPACITY in Great Britain, for public supply, was 30,208 megawatts at the end of May as compared with 29,275 megawatts at the end of December last, and 27,796 megawatts at the end of December, 1959.

Advantages of Unit Tooling Systems

(*Continued from page* 119)

formed from the component drawings, and decides on the best construction. Because the assembly times are normally so short, it may also be found preferable to dismantle fixtures as soon as batches of workpieces have been completed, rather than store them for future use. The units may then be returned to stock where they are available for incorporation in other tools.

As an indication of the economies that may be obtained from the adoption of the unit tooling system, it may be noted that a large organization in Eastern Germany has reported direct savings of £22,700 per year from the use of a single—admittedly somewhat elaborate—set of fixture-building equipment.

Peco Open Day

An open day was held recently by The Projectile & Engineering Co., Ltd., at their works in Thessaly Road, London, S.W.8, and it was estimated that the event attracted some 2,000 visitors, the majority of whom were relatives and friends of the company's employees. Visitors were afforded an opportunity of touring all parts of the extensive works which have been expanded fourfold since 1887, when the company moved to the site from premises in Bishopsgate. Originally, one of the main activities was the production of projectiles for the armed forces. Later, at the turn of the century, the manufacture of seamless steel vessels, including cylinders for the storage of industrial gases, was started.

After the end of the first world war, the manufacturing policy was modified to meet changed industrial conditions, and equipment was provided for the production of parts for the vehicle industry which was then expanding rapidly. Large presses were installed and the production of chassis for a number of motor car firms was begun. This activity has become an established part of the company's programme, and today a substantial proportion of the workshop facilities is devoted to the pressing, assembling, and coating of motor vehicle frames.

The firm is well known also for a range of die casting machines and injection moulding machines both of which are distributed by PECO Machinery Sales (Westminster), Ltd., 28 Victoria Street, London, S.W.1. Examples of large machines in these two categories, which were on view to visitors during the open day, included a 60 MP 60 injection moulding machine with a locking force

of 750 tons and a production rate of 200 lb. of plastics parts per hour, a 50 MP 60 machine of the same type, and a 60 DC 20 die casting machine—all destined for export markets.

Demonstrations in the large press shop were concerned with the production of chassis members for a light van and a 5-ton lorry, and the front suspension of a saloon car. The largest press in the shop, built by Wilkins & Mitchell, Ltd., Darlaston, and rated at 2,500 tons, was employed for blanking the lorry chassis side members from steel plate, and additional tooling was displayed adjacent to this press. In the heavy machine shop a large horizontal borer, by Innocenti, was set up for operations on platens for injection moulding machines, and a Schwartzkopff (Berliner Maschinenbau) precision vertical boring machine was shown working under programme control.

New Premises of G. F. Bridges

G. F. Bridges, Ltd., inform us that they are now in occupation of their new, specially-designed, premises at Bordesley Green, Birmingham, which are arranged to permit rapid handling of bolts, nuts, and screws. Bulk bagged stocks are stored on an overhead platform served by elevators and chutes, and stock in cartons, covering fasteners in a great variety of sizes and materials, including stainless steel, is held on the ground floor in steel bins, some of which are seen in the illustration.

A view in the new premises of G. F. Bridges, Ltd.

The company, also has premises at Hill Top, West Bromwich, and is an official distributor for Guest, Keen & Nettlefolds, Ltd., Unbrako, Ltd., Simmonds self-locking nuts, Heli-Coil screw thread inserts, and other well known firms and products.

Trade Publications

ADDISON ELECTRIC CO., LTD., 10-12 Bosworth Road, London, W.10. Leaflet describing the type 660 transistorized cable fault and path locator. Inductive, acoustic, and capacitive probes are available.

FRANK WHITELEGG, LTD., 304 High Street, Sutton, Surrey. Leaflet describing wire weaving looms made by the German firm Emil Jäger KG. These machines comprise the ESb single beat type and the DLa double beat type. Both can be supplied for weaving widths from 40 to 80 in., and have weaving ranges of 1 to 25 meshes per in.

ROCKWELL MACHINE TOOL CO., LTD., Welsh Harp, Edgware Road, London, N.W.2. Well-presented and fully illustrated publication concerned with the Diskus-Werke types DD and DDH double-sided surface grinding machines and their applications. The use of swivel and automatic rotating work-holding fixtures is discussed, also special arrangements for grinding rollers faces, striker forks, Alnico magnet cores, clutch linings, and typewriter levers. A separate section is devoted to the DDH machines, which have hydraulically-operated work-tables. Another publication is concerned with the type DW machines for single-sided grinding of quantity produced components, such as poppet valves, tappets, bushes and brake linings.

THE CARBORUNDUM CO., Niagara Falls, N.Y., U.S.A. Brochure giving particulars of a wide range of materials which have been developed to meet various severe service requirements. Many of these materials, it is stated, are available in full commercial quantities. Sections of the brochure are devoted, for example, to new forms of silicon carbide including types designated KT and GRB, and refractories.; Fiberfrax ceramic fibre; boron nitride; boron carbide; fused magnesium oxide refractories; zirconium and hafnium; Kovar iron-nickel-cobalt alloy; electrically fused aluminium oxide refractories; hot-pressed alumina; carbides of zirconium, titanium and hafnium; and diborides of zirconium, titanium, and tungsten. The company are represented in this country by The Carborundum Co., Ltd., Trafford Park, Manchester.

Obituary

MR. L. G. WHITELEY, a director of Wm. Newsome & Son, Ltd., Central Works, Sowerby Bridge, Yorks., died recently after a long illness following an operation. He served on the Council of The British Association of Machine Tool Merchants for a number of years following his election in 1947, and prior to this period, and subsequently, took a keen interest in Association affairs. He was very active in the formative period of the Northern Area Committee, was a regular attender at meetings, and was at one time chairman.

MR. GEORGE SANDLAND of The International Nickel Company (Mond), Ltd., Thames House, Millbank, London, S.W.1, died suddenly on July 8, when returning from a company sports outing at Birmingham. Trained as an engineer-designer with Vickers-Armstrongs, he joined the company 35 years ago, and played an active part in building up the Development and Research Department. He was also responsible for seeing the first issue of the *Nickel Bulletin*—and many subsequent issues—through the press. As a result of his work on development and research in the last war, his health broke down, and a long period of treatment and rest followed. Subsequently he rejoined the Publicity Department and latterly played a prominent part in connection with the nickel plating "labelling scheme."

Personal

MR. R. MENHENIOTT, a technical representative in the industrial branch at the Cardiff office of Holman Brothers, Ltd., Camborne, Cornwall, has been transferred to North Wales, and will operate from 30 Plastirion Avenue, Prestatyn.

MR. J. F. PRINCE, M.I.Ex., manager of the export sales department at the Witton Works of the General Electric Company, Limited of England, Engineering Group, has retired after 42 years' service, and has been succeeded by MR. K. D. STARR, B.Sc., A.M.I.E.E., A.M.I.Mech.E.

The following new appointments have been announced:—

MR. MICHAEL G. WHYLES, F.R.S.A., as publicity manager of The Colchester Lathe Co., Ltd., Colchester, and the associate firm, Gamet Products, Ltd.

DR. H. J. PHELPS, M.A., Ph.D., as consultant to Maxam Power, Ltd., and Goodyear Pumps, Ltd., two member companies of The Holman Group of Camborne, Cornwall.

MR. MICHAEL COLLINS as material controller and assistant to the general manager of Advance Components, Ltd., Roebuck Road, Hainault, Ilford, Essex. He was formerly export manager of the company.

MR. H. R. BROOKER, hitherto general sales manager, as a joint managing director of Johnson, Matthey & Co., Ltd., 73-83 Hatton Garden, London, E.C.1. He will continue to be principally responsible for all the sales divisions of the company.

MR. W. H. TAYLOR, B.Sc.(Eng.), M.I.E.E., as manager, Group Personnel Services, Associated Electrical Industries (Rugby), Ltd. He will be responsible for all personnel and associated matters, not only for the management company but for the Rugby-managed divisions and subsidiary companies of A.E.I.

COMMANDER M. G. LYNE, R.N.(Ret.), at present chief planning engineer for Distington Engineering Co., Ltd., a subsidiary of The United Steel Companies, Ltd., as production manager (engineering) with effect from August 1, and MR. J. W. LOWE, formerly acting machine shop manager, as machine shop manager.

MR. J. L. THOMPSON, general manager and director, as managing director, MR. D. GEMMELL, A.M.I.E.E., executive director, as general manager of the Swindon establishment, and MR. R. G. CAMP, sales manager, as executive director of Square D, Ltd., Cheney Manor, Swindon, Wilts.

MR. DAVID H. BRAMLEY as production director of Geo. Salter & Co., Ltd., West Bromwich, in succession to Mr. P. P. C. Drabble, who is retiring at the end of July. Mr. Bramley, who is 47 years of age, joined the board of the company in an advisory capacity in 1958, and has since been responsible, also, for the management training service of Urwick Orr & Partners, management consultants, but will now relinquish that position. He is a member of the Institutions of Mechanical and Production Engineers.

Vibro-Meter Micro-switch Controls

In an article on p. 139 of this issue of MACHINERY reference is made to snap-action micro-switches for which Vibro-Meter Corporation, Fribourg, Switzerland, hold the exclusive manufacturing licence. It should have been pointed out in this connection that the company is represented in the United Kingdom by Cossor Instruments, Ltd., Cossor House, Highbury Grove, London, N.5.

Machine Tools at the Soviet Exhibition

(*Continued from page* 164)

of the scale line image may be determined to 0·002 mm. For final positioning under power, one of the fine feed rates is employed.

Accuracy of positioning of the slides with this system is claimed to be within ±0·003 mm. (±0·00012 in.), and it is stated that the diameters of bores produced can be held to ±0·008 mm. (±0·00032 in.). At the Sverdlova factory, it may be noted, two other sizes of this machine are also built, the largest having table dimensions of 4·6 by 7·2 ft., and admitting up to 6·5 ft. between the columns, also horizontal borers up to 11·8 in. spindle diameter, and large floor-type boring and milling machines.

Importation of Russian-built machine tools into this country is being handled by United Machinery Services, Ltd., 4/7 Burford Road, London, E.15, and Machine Tool Agencies, Ltd., 79 Portland Place, London, W.1.

Machine Tool Exports and Imports

EXPORTS OF MACHINE TOOLS

Type of Machine	Month ended April 30, 1961	Four months ended April 30	
		1960	1961
	Value £	Value £	Value £
New, complete:—			
Bar and chucking automatics	67,904	254,058	398,608
Boring machines:			
Vertical	81,850	150,637	496,579
Other	80,448	639,321	358,952
Drilling machines	100,025	484,191	538,022
Gear-cutting machines	35,547	402,251	301,911
Grinding, lapping and honing machines	309,940	902,190	1,235,408
Lathes:			
Capstan and turret	261,077	669,210	1,092,960
Other	502,304	1,332,351	1,508,767
Milling machines	252,857	669,875	996,479
Planing machines	30,601	100,346	145,474
Presses:			
Hydraulic	76,865	681,142	345,053
Other	91,641	563,398	483,716
Punching and shearing machines	49,625	187,081	298,206
Other plate and sheet-metal working machines, including straightening rolls	59,783	226,936	275,343
Screwing and threading machines	86,438	288,144	343,665
Shaping and slotting machines	25,709	131,800	180,993
All other machines	272,438	907,843	1,261,247
Used, complete	88,806	348,586	287,329
Parts	344,704	960,675	1,530,542
Total	2,818,562	9,900,035	12,079,254
Destination			
Union of South Africa	140,042	372,013	579,597
India	474,082	1,155,457	1,820,304
Australia	351,897	2,263,939	1,774,658
New Zealand	59,764	142,289	305,771
Canada	93,329	480,308	554,154
Other Commonwealth countries	181,046	500,945	705,478
Soviet Union	157,403	154,802	403,337
Sweden	109,951	185,915	413,212
Western Germany	128,259	277,059	609,153
Netherlands	107,715	164,237	326,263
France	111,843	602,319	493,679
Spain	42,559	198,212	293,994
Italy	240,910	227,489	778,480
United States of America	67,530	977,652	416,316
Other foreign countries	552,232	2,197,399	2,604,858

IMPORTS OF MACHINE TOOLS

New, complete:—			
Bar and chucking automatics	60,517	182,200	298,094
Boring machines	221,031	482,472	489,427
Drilling machines	53,635	91,255	156,039
Gear-cutting machines	139,925	129,660	963,710
Grinding, lapping and honing machines	496,270	1,026,849	1,771,555
Lathes	242,665	604,178	1,188,635
Milling machines	252,480	945,478	1,011,585
Planing, shaping and slotting machines	71,404	82,856	241,825
Presses	203,586	403,579	668,012
All other machines	910,634	1,002,733	2,170,091
Used machines, complete	72,875	367,508	296,705
Parts	339,919	997,592	1,245,276
Total	3,064,941	6,316,360	10,500,954
Country of Origin			
Western Germany	665,414	1,769,564	2,765,784
Switzerland	300,209	942,408	1,123,673
U.S. America	1,450,322	2,360,638	4,559,254
Other countries	648,996	1,243,750	2,052,243

Industrial Notes

FENTER MACHINE TOOLS, LTD., 184 Aston Road, Birmingham, 6, have been appointed sole agents in the United Kingdom for the Eumuco range of forging machines.

THE BRITISH WAGON CO., LTD., are to open an additional branch, on July 24, at Rotherham House, 229 Manningham Lane, Bradford, 8, Yorks. (telephone, Bradford 46745/6).

THE COMBUSTION ENGINEERING ASSOCIATION, 70 Jermyn Street, London, S.W.1, will stage a display of coal and ash handling equipment at the British Railways goods yard, Salford, Lancs., on September 19-21.

THE NUMBER EMPLOYED IN MANUFACTURING INDUSTRIES decreased by 3,000 in May, to a total of 8,913,000. There was a rise of 3,000 in " engineering and electrical goods," and of 2,000 in " vehicles." In " shipbuilding and marine engineering " the number was unchanged, and there was a fall of 1,000 in " metal manufacture."

SQUARE D, LTD., Cheney Manor, Swindon, Wilts., have introduced a new range of all-metal, oil-tight, push-buttons, which can be supplied with or without removable plastics caps in a range of seven colours. These colour caps are also available separately and can be assembled to uncapped buttons, as required.

RAPID MAGNETIC, LTD., Lombard Street, Birmingham, 12, inform us that they have introduced means for avoiding premature release (due to supply failure) of tramp iron extracted by electro suspension magnets. Auxiliary built-in permanent magnets retain the collected iron until the holding force is neutralized by operating the contactor controller and reversing the current.

PRODUCTION ENGINEERING BURSARY.—The Council of the Institution of Production Engineers, 10 Chesterfield Street, Mayfair, London, W.1, announce that the Schofield Travel Scholarship Scheme has been discontinued and is being replaced by a bursary of £600 per annum, tenable at a United Kingdom university, for post-graduate studies in production engineering.

TIMES MACHINERY CO., LTD., Poyle Road, Colnbrook, Slough, Bucks., inform us that they have been appointed by Technoimpex as exclusive distributors in the United Kingdom for the full range of Hungarian-built lathes, milling machines, grinding machines, and pantograph engraving machines. Various Hungarian machine tools exhibited at the Leipzig Fair this year were described in MACHINERY, 99/35—5/7/61.

I.PROD.E. SUMMER SCHOOL.—A summer school organized by the Institution of Production Engineers, 10 Chesterfield Street, Mayfair, London, W.1, will be held at the College of Aeronautics, Cranfield, from August 29 to September 1. The subject will be: " The inter-relation of work study, ergonomics, operational research, and cybernetics, and their application to production engineering." Particulars may be obtained from the above address.

MATTERSON, LTD., Shawclough, P.O. Box 31, Rochdale, Lancs., have received an order from Vickers-Armstrongs (Aircraft), Ltd., for two 74-ft. span overhead cranes, of 5 and 2 tons capacity, to provide improved handling facilities in the skin-milling shop at the Weybridge works. Production capacity of this shop is being augmented to meet requirements in connection with the Vickers Vanguard, the VC10, and the BAC One-Eleven aircraft.

SENIOR STAFF CONSULTANTS, LTD., 7 Cork Street, London, W.1, have formed a special department which will be concerned exclusively with the recruitment and appointment of staff for all aspects of computer work. In this connection they have retained the services of Computer Consultants, Ltd., and have taken over the specialist staff appointment service previously operated by that company.

I.G.E. CONTROL EQUIPMENT, LTD., Court Road, Birmingham, 12, the automation and control division of the Udal Group, inform us that they are now equipped to design and supply control panels for all industrial applications. The company specializes in " packaged " controls for power presses and auxiliary equipment, also in the development of complete automatic handling projects, and the conversion of existing plant and machinery to automatic operation.

TELEHOIST, LTD., hydraulic engineers and makers of tipping gear and bodies, have taken over factory premises in Sunbeam Road, Chase Road, London, N.W.10, hitherto occupied by Wilmot Breeden, Ltd., with whom they are associated. The factory provides an area of about 12,000 sq. ft. of production space, and is now being converted. There will be five vehicle fitting bays, indoor parking facilities, and ample storage space for bodies, sub-frames, gears, spares, and general components.

ROTO-FINISH, LTD., Mark Road, Hemel Hempstead, Herts., have introduced Universal White compound which is intended for polishing prior to decorative plating or for final lustre finishing and can be employed for most metals. It is claimed that a fine finish can be rapidly obtained, for example on nickel, copper, brass, and stainless steel. The compound, it is stated, incorporates a special binding compound which is easily soluble, so that subsequent cleaning is facilitated.

FREIGHT TRANSPORT TO NORTHERN IRELAND. To cope with the heavy and rapidly increasing trade between Northern Ireland and England, two ships specially built for " container " transport have recently been introduced on the Heysham-Belfast run. British Railways announce that with the existing cargo vessels used on this route a total of 18 sailings per week, in both directions, is now provided. A complementary freight rail service connects Heysham with all parts of England and Wales.

WELDALL-GRIGG MACHINE TOOLS is the title of an organization which will in future be responsible for the sales of Weldall-Grigg mechanical and hydraulic presses, Eldair presses brakes and plate shears, and Weldall-Fried equipment. The central sales office will be in Stour Street, Birmingham, and the London office at 65-67 Hanworth Road, Hounslow, Middlesex. Mr. C. Pendry, who was formerly with Drummond-Asquith, is sales manager, and Mr. R. A. Hammond, assistant sales manager.

RENAULT MACHINE TOOLS (U.K.), LTD., Shrewsbury, inform us that they have recently received further orders for several unit construction machines to a total value of more than £80,000. These machines will be supplied to the heavy vehicle industry, and it is pointed out that with the form of construction employed, future modifications of component designs can frequently be accommodated by re-arrangements of the units to provide for changes in machining sequences. Considerable capital expenditure may thus be avoided in some instances.

METADUCTS, LTD., Catherine Wheel Road, Brentford, Middlesex, have introduced a new series of all-metal, flexible, power transmission couplings for light duties. Marketed under the name DIS, these new couplings cover a capacity range from 1 to 40 h.p. at 1,000 r.p.m. Incorporating design features similar to those of the company's Metastream type, the couplings will compensate for misalignment and axial deflection, and will not transmit thrust. Each incorporates stacks of 0·005-in. thick stainless steel discs, riveted together and assembled into integral membrane units.

Aven Bandsaw Protective Strip

In MACHINERY, 99/100—12/7/61, reference was made to special protective strip which has been developed by Hack Saws, Ltd., Aven Works, Capel Street, Sheffield, 6, for use with their Aven bandsaw blades. It should have been pointed out that this strip is intended only for application to blades of ½-in. width and over which have been cut to the required length and joined.

Standard for Spheroidal Graphite Iron

A revised British Standard (B.S.2789:1961) has been issued for "iron castings with spheroidal or nodular graphite." The number of grades of material covered has been increased from three in the original (1956) edition, to six, as a result of experience gained in recent years. Types of iron now covered are as follows: those with a ferritic matrix in which resistance to impact is of paramount importance; with a mainly ferritic matrix of moderately high tensile strength in which high ductility and toughness are essential; with a ferritic-pearlitic matrix combining strength with reasonable ductility; and with a mainly pearlitic matrix, characterized by high tensile strength, but intended for applications where ductility and resistance to impact are of less importance.

Clauses of the specification are concerned with freedom from defects, provision of test samples, optional tests, mechanical tests, and properties.

Copies of the standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1 (price 5s., postage extra to non-subscribers).

Corrections

In the advertisement for the London Shafting & Pulley Co., Ltd., on page 7 of this issue of MACHINERY, the address should be Northdown Street, London, N.1.

IN MACHINERY, 99/89—12/7/61, reference was made to the application of Dubo nylon locking rings to nuts on electrical equipment installed at the works of John Mountford Co., Ltd. The address of this company should have been given as Clayton Forge, Manchester, 11.

Scrap Metals

†LONDON.—‡Prices per ton for non-ferrous scrap metals free from iron are as follows:—Clean copper wire, untinned and free from lead and solder, £200; clean heavy copper, untinned and free from lead and solder, £194; copper wire No. 2, £190; clean light copper, £186; braziery copper, £163; gunmetal, £174; brass, mixed, £126; lead, net, £51; zinc, £40; cast aluminium, £93; old rolled aluminium, £96; battery lead, £26; unsweated brass radiators, £102; hollow pewter, £565; black pewter, £445.

MIDLANDS.—The market during the last few days has tended to emphasize the fluctuations in values of tin and copper, by first regaining and then losing interest. As a result, the scrap trade generally has been somewhat unstable and prices for copper offered by merchants are still on the cautious side.

Business continues to be fairly brisk, as most grades are in demand, and there is a tendency for lead and aluminium to be held in stock in the hope—which may be in vain—of a slight increase in prices, until lack of storage space necessitates a sale.

Overall, a substantial tonnage is changing hands. Most works have cleared accumulations before the start of the holidays later this month, but further supplies of scrap from builders' and plumbers' yards are normally offered at about this time of the year.

The general position as regards various kinds of metals is as follows:—

Copper. Real interest is being shown, and trading is steady with better prices for the higher grades. Braziery material can be moved quite easily if the seller is prepared to accept the slight easing in value which has been apparent recently with this rather bulky material.

Brass. Good demand for all grades of solid material.

Gunmetal. A consistently good tone is maintained, and outlets are readily available.

Lead. Some merchants may have been induced to sell when prices rose slightly about two weeks ago. Values have since returned to an uninteresting level.

Aluminium. The outlook is not very inspiring. Prices remain low and buyers are very selective.

Zinc. Demand is steady with little change in values.

† George Cohen, Sons & Co., Ltd., 600 Wood Lane, London, W.12
‡ Subject to market fluctuations.

Machine Tool Share Market

Stock markets were generally dull and unsettled during the period under review, with restricted volume of business, and price movements mainly downward.

The gilt-edged section, after being quiet but steady, became depressed, and British Funds, together with other high grade fixed interest stocks, finished with a setback in values.

Subdued conditions prevailed in the commercial and industrial sections and share prices generally tended to fall. There was some resistance to the downward drift, but changes, on balance, were irregular with declines predominating.

Among machine tool issues Edgar Allen lost 2s. 9d. at 37s.; Birmingham Small Arms, 6d. at 24s.; Broom & Wade, 6d. at 24s. 3d.; Geo. Cohen, 3d. at 11s. 9d.; Coventry Gauge & Tool, 2s. 7½d. at 29s. 3d.; Craven Bros. (Manchester), 6d. at 8s. 6d.; Alfred Herbert, 4s. 6d. at 65s.; John Holroyd "A," 3s. at 17s. 6d.; A. A. Jones & Shipman, 2s. 3d. at 23s. 9d.; Kerry's (Gt. Britain), 3d. at 10s.; Samuel Osborn, 1s. 3d. at 49s.; Ambrose Shardlow, 6d. at 61s. 6d.; Scottish Machine Tool, 6d. at 9s.; W. E. Sykes "B," 1s. 3d. at 28s. 9d.; and Tap & Die Corporation, 3d. at 16s. 3d.

On the other hand, British Oxygen advanced 1s. to 22s.; Macready's Metal, 6d. to 16s. 6d.; and John Shaw & Sons (Wolverhampton), 1½d. to 17s. 7½d.

GEORGE COHEN 600 GROUP, LTD. Final dividend 8½ per cent, making, with the interim, a total of 13 per cent.

JOHN HARPER & CO., LTD. Final dividend 6 per cent, making a total of 10 per cent.

New Companies Registered*

HENRY KIRK (MACHINE TOOLS), LTD., North Road, Yate, Glos.—Registered June 26, 1961. Nom. cap.: £10,000 in £1 shares. Directors: H. J. Kirk and Mrs. G. Kirk, 145 North Road, Yate, Glos.

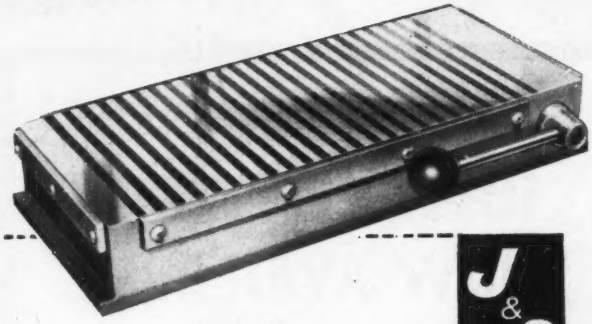
H. G. EMPSON & SONS, LTD., 75 Swindon Road, Stratton Street, Margaret, Swindon, Wilts.—Registered June 23, 1961. To carry on the business of precision engineers, etc. Nom. cap.: £6,000 in £1 shares. Directors: H. G. Empson and Mrs. E. V. Empson.

H. TRIPPEAR & CO., LTD., Carriage Company Buildings, Hudson Street, Rochdale.—Registered June 21, 1961. To carry on the business of tool die makers, etc. Nom. cap.: £6,000 in £1 shares. Directors: H. Trippear and G. Fentem.

* From the lists compiled by Jordan & Sons, Ltd., Company Registration Agents, 116-118 Chancery Lane, London, W.C.2.

COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	2/3
Allen (Edgar) & Co., Ltd.	Ord.	£1	37/-
" "	5% Prf.	£1	13/6*
Arnott & Harrison, Ltd.	Ord.	4/-	16/3
Asquith Machine Tool Corp., Ltd.	Ord.	5/-	10/-
" " "	6% Cum. Prf.	£1	16/6
Birmingham Small Arms Co., Ltd.	Ord.	10/-	24/-
" " "	5% Cum. "A" Prf.	£1	14/6
" " "	6% Cum. "B" Prf.	£1	17/-
" " "	4% 1st Mort. Deb.	Stk.	90½
British Oxygen Co., Ltd.	Ord.	5/-	22/-xd
" " "	6% Cum. Prf.	£1	19/-
Brooke Tool Manufacturing Co., Ltd.	Ord.	5/-	9/10½
Broom & Wade, Ltd.	Ord.	5/-	24/3
" "	6% Cum. Prf.	£1	16/6
Brown (David) Corporation, Ltd.	5½% Cum. Prf.	£1	15/-
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	17/-
Butler Machine Tool Co., Ltd.	Ord.	5/-	16/3
" " "	5% Cum. Prf.	£1	14/3
Churchill (Charles) & Co., Ltd.	Ord.	2/-	8/10½
" " "	6% Cum. Prf.	£1	25/7½‡
Clarkson (Engrs.), Ltd.	Ord.	5/-	40/-
Cohen (George), 600 Group, Ltd.	Ord.	5/-	11/9
" "	4½% Cum. Prf.	£1	12/-
Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	29/3
" " "	5% Cum. Red. Prf.	£1	16/3
Craven Bros. (Manchester), Ltd.	Ord.	5/-	8/6
Elliott (B.) & Co., Ltd.	Ord.	1/-	2/9
" "	4½% Red. Cum. Prf.	£1	12/-
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	10/6
Greenwood & Batley, Ltd.	Ord.	10/-	20/1½xd
Harper (John) & Co., Ltd.	Ord.	5/-	8/4½
" " "	4½% Red. Cum. Prf.	£1	11/7½
Herbert (Alfred), Ltd.	Ord.	£1	65/-
Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	17/6
" "	"B" Ord.	5/-	17/6
Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	23/9
" "	7% Cum. Prf.	5/-	4/9
Kearney & Trecker-C.V.A., Ltd.	5½% Red. Cum. Prf.	£1	11/-
" "	Prefd. Ord.	£1	13/9
Kearns (H. W.) & Co., Ltd.	Ord.	5/-	24/-
Kerry's (Gt. Britain), Ltd.	Ord.	5/-	10/-
Macreadys Metal Co., Ltd.	Ord.	5/-	16/6
Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/6
Massey (B. & S.), Ltd.	Ord.	5/-	11/-
Newall Engineering Co., Ltd.	Ord.	2/-	8/-
Newman Industries, Ltd.	Ord.	2/-	7/-
" "	6% Prf. Ord.	5/-	5/-xd
Noble & Lund, Ltd.	Ord.	2/-	6/-
Norton, W. E. (Holdings), Ltd.	Ord.	2/-	8/6
Osborn (Samuel) & Co., Ltd.	Ord.	5/-	49/-
" " "	5½% Cum. Prf.	£1	23/-
Pratt (F.) & Co., Ltd.	Ord.	5/-	18/3
Sanderson Kayser, Ltd.	Ord.	10/-	32/6
" "	6½% Cum. Prf.	£1	16/3
Scottish Machine Tool Corporation, Ltd.	Ord.	4/-	9/-
Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	61/6
Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	17/7½
Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	19/3
" " " "	5% Cum. Prf.	£1	13/9
Stedall & Co., Ltd.	Ord.	5/-	7/9
Sykes (W. E.), Ltd.	"B" non-voting Ord.	10/-	28/9
Tap & Die Corporation, Ltd.	Ord.	5/-	16/3
" " "	4½% Deb. 1961-1977	Stk.	82½
Wadkin, Ltd.	Ord.	10/-	26/-
Ward (Thos. W.), Ltd.	Ord.	£1	75/-
" "	5% Cum. 1st Pref.	£1	13/6
" "	5% Cum. 2nd Pref.	£1	21/6
Willson Lathes, Ltd.	Ord.	1/-	3/-

The Middle Prices given in the list are in several cases nominal prices only and not actual dealing prices. Every effort is made to ensure accuracy, but no liability can be accepted for any error. * Sheffield price. ‡ Birmingham price.



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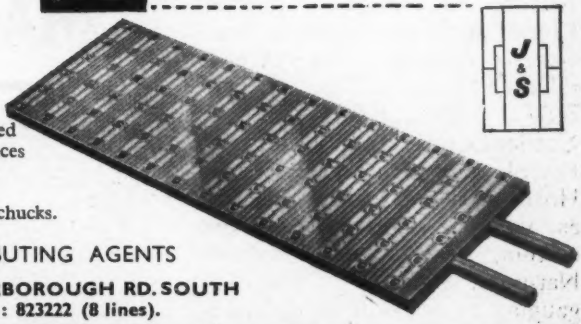

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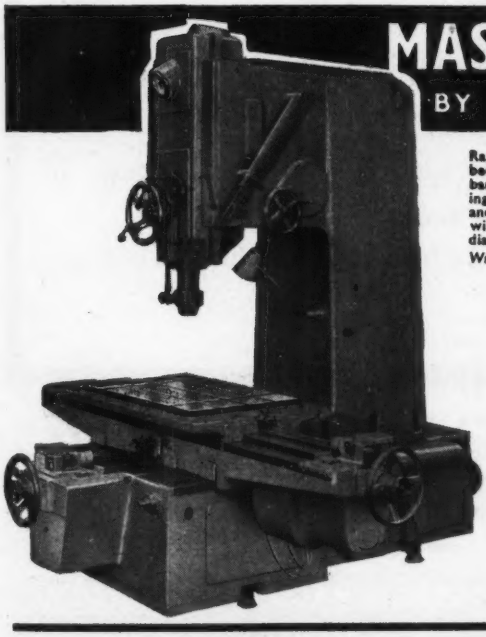

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Write for full details.

BRIEF SPECIFICATION

Table size: 25in. by 42in.
Longitudinal travel: 30in.
Saddle cross movement: 18in.
Settings to 0·0002in.
Steplessly variable spindle speeds up to 1,800 r.p.m.
Feeds (4) from 0·001in. to 0·008in.
Power setting traverse 60in. per min.
Floor space: 115in. by 115in.

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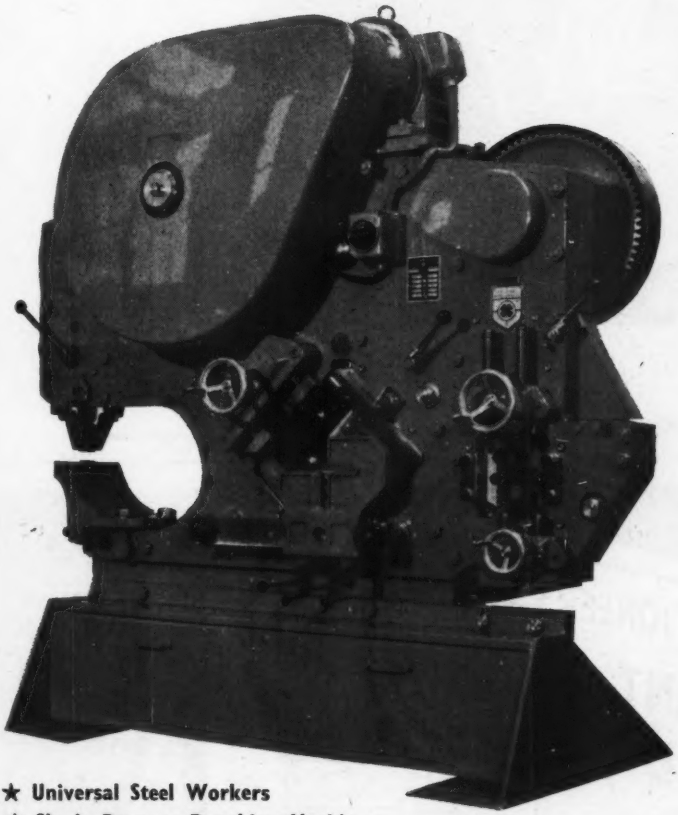

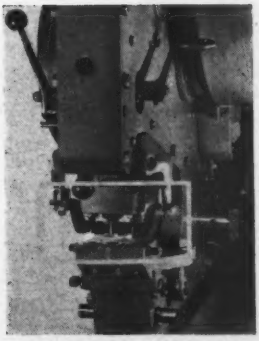

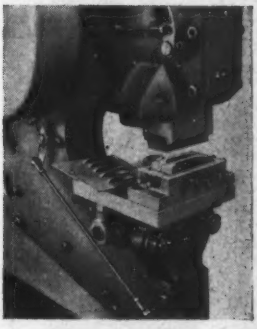

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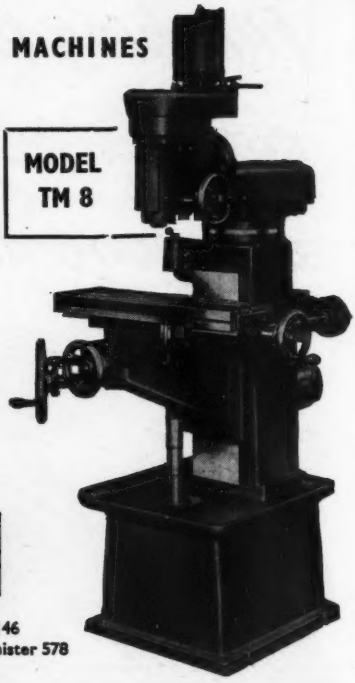
STANDARD MILLS

Model	Table	Table to Spindle
1	22in. by 6¼in.	16in.
2	28in. by 6¼in.	16in.
3	28in. by 8in.	15in.
4	28in. by 8in.	19in.
5	28in. by 10in.	19in.

MARLOW TURRET MILLS

Radial and Sliding Arm, Swivelling and Down Feed Head. Power Feed to table optional.

Model	Table	Table to Spindle
T.M.8	28in. by 8in.	19in.
T.M.10	28in. by 10in.	19in.



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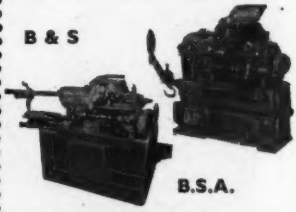

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Can now offer

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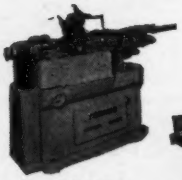

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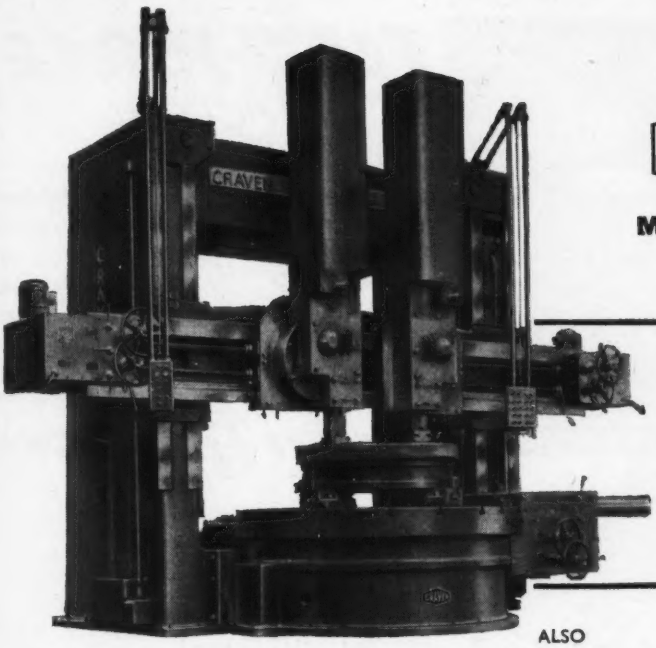

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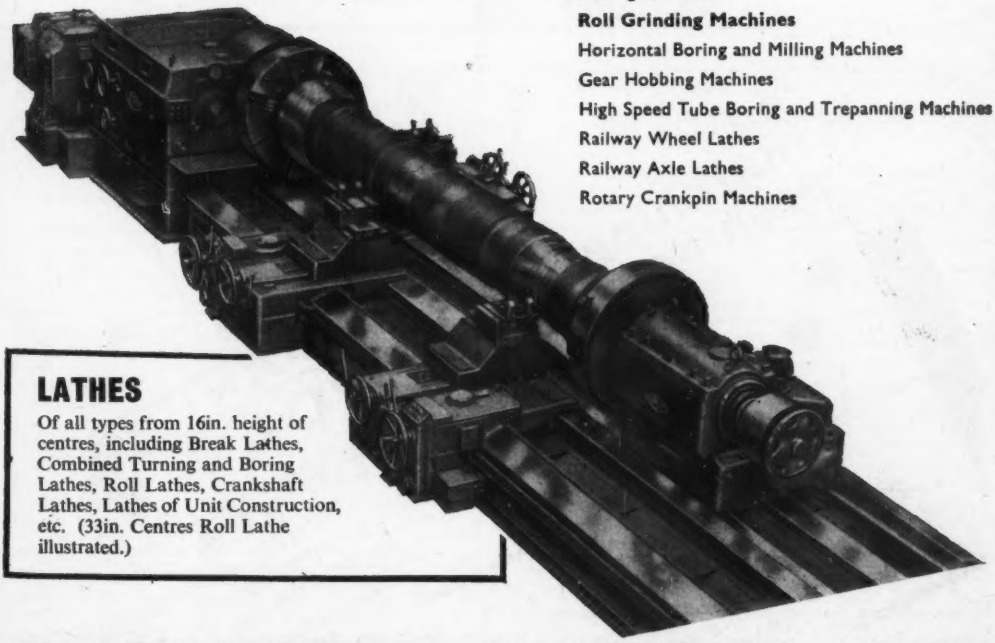

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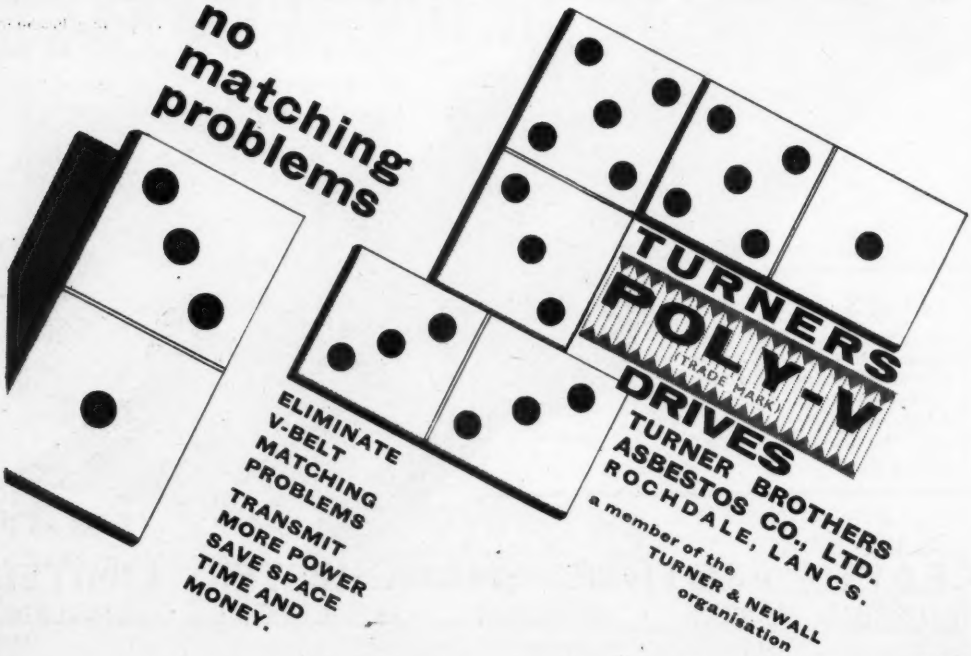

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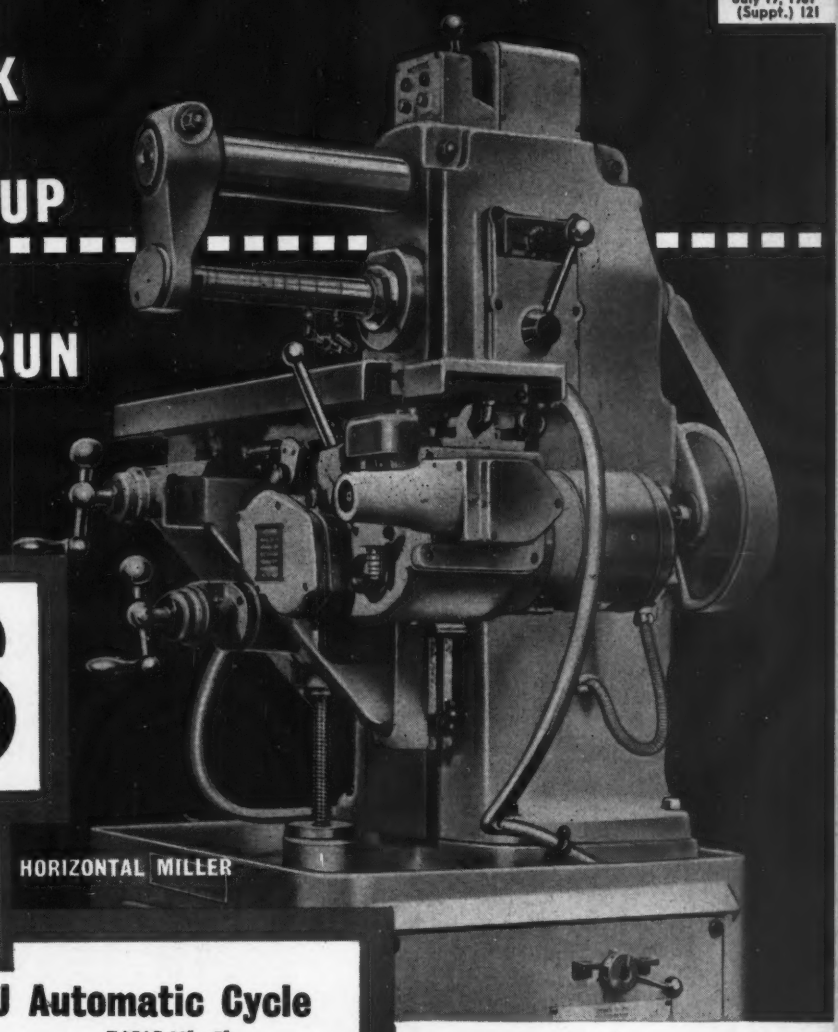

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A-J Automatic Cycle

TABLE 26" × 7"

For small batches or quantity production, this miller gives you the reliability of completely mechanical operation: ten feeds; No. 40 taper spindle; powerful, rugged construction. Like all models in the outstanding A & S Model 1 range, the A-J can be supplied with attachments for special operations. For versatility and value in small milling machines, nothing can equal the A & S Model 1 range.

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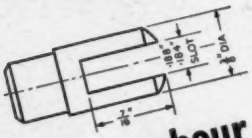
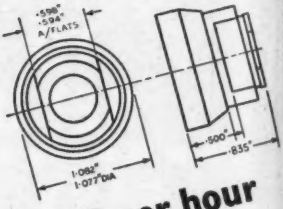


1450 per hour
Mill Slot Fork End (A1-1)

780 per hour
Mill Slot and 2 Flats
Pedal Spindle (Mild Steel)



240 per hour
Mill 2 Flats — Actuator (EN7A-V1B)

NOTE THESE MILLING TIMES

These are typical of the times being regularly recorded by AHCOL users on simple milling jobs such as slots, flats, faces, etc. With automatic work clamping and continuous cycle, milling becomes exceedingly simple and rapid.

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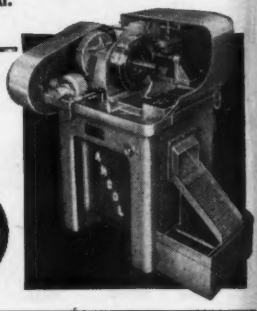
Semi-Automatic

ROTARY MILLING MACHINES

Write for Illustrated Brochure M/177

	AHCOL STANDARD	AHCOL ROTAMILL
Work drum dia.	12"	12"
Cutter dia.	4"	6"
Cutter width ganged	4"	6"
Motor	1 h.p.	5, 7½ or 10 h.p.



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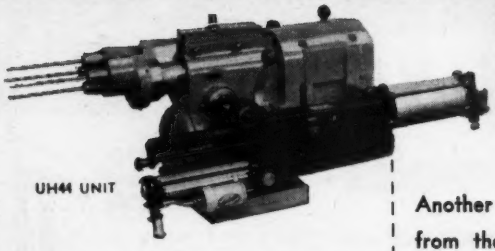
GRIMSTON UNIT heads



UH44 UNIT

Above is shown Unit Head type UH44, fitted, in this example, with automatic hydraulic / pneumatic feed control and provided with four spindle speeds. The multi-spindle drilling attachment was designed to suit special requirements.

Another Unit Head from the GRIMSTON range, this model is available with 4, 8, 12 or 16 spindle speeds, arranged with manual or geared power feeds.

Ask for details, quoting Ref. M19.

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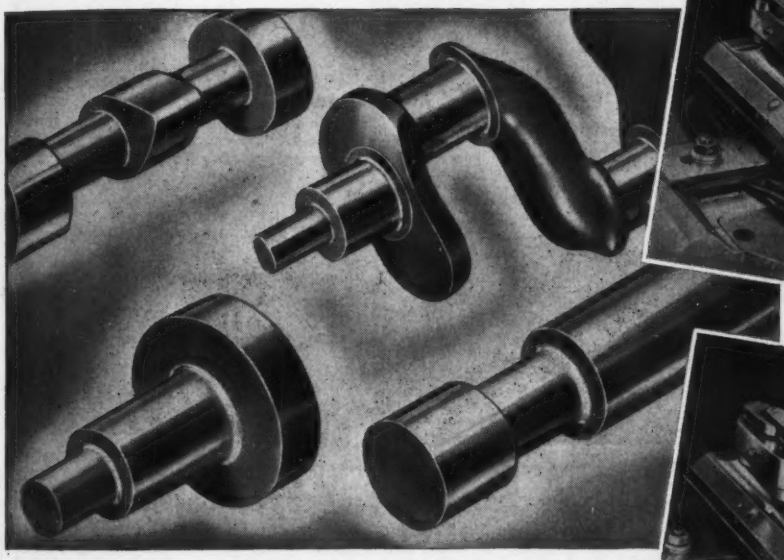

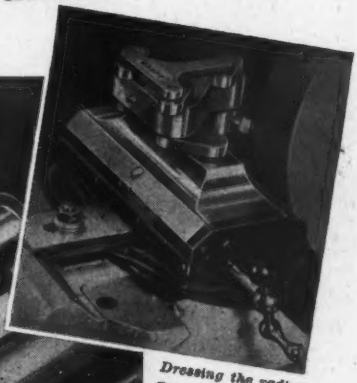

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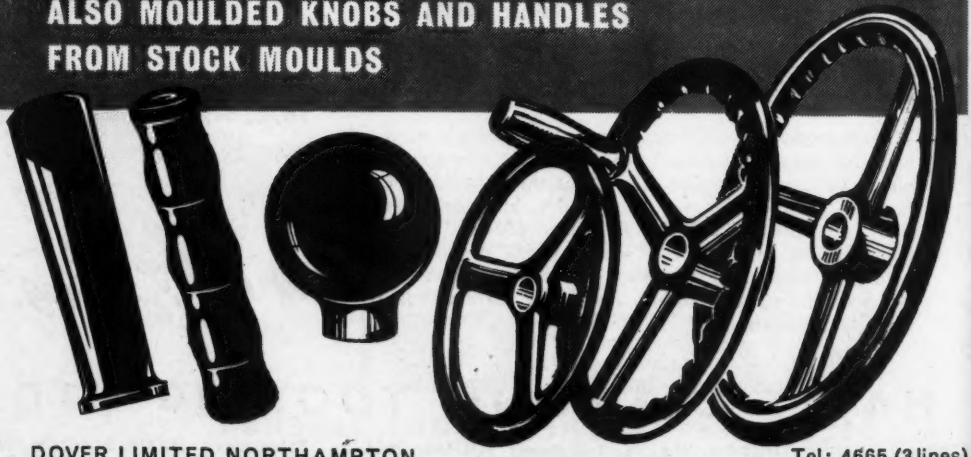

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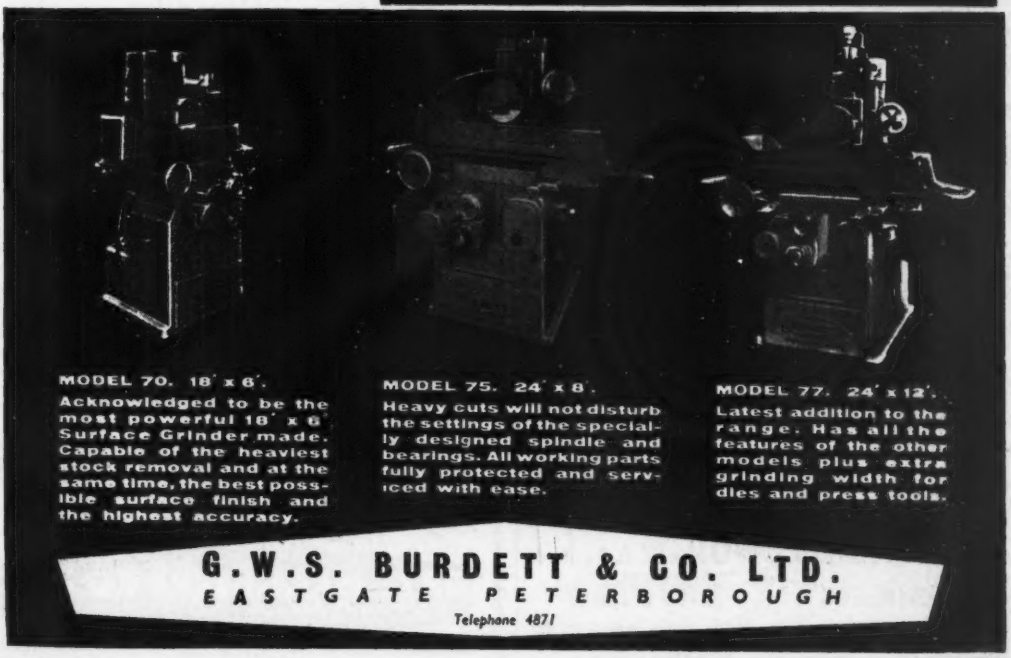

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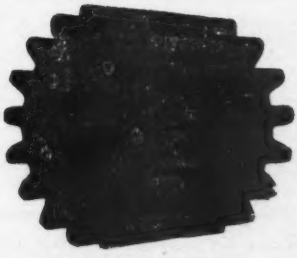

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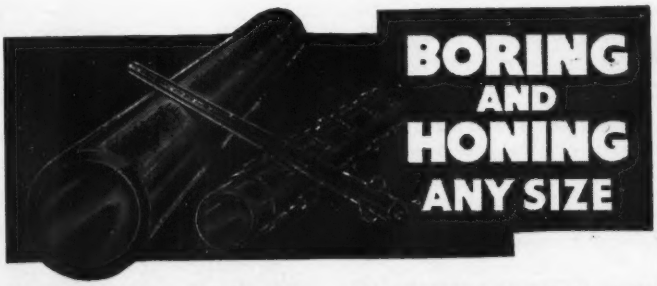

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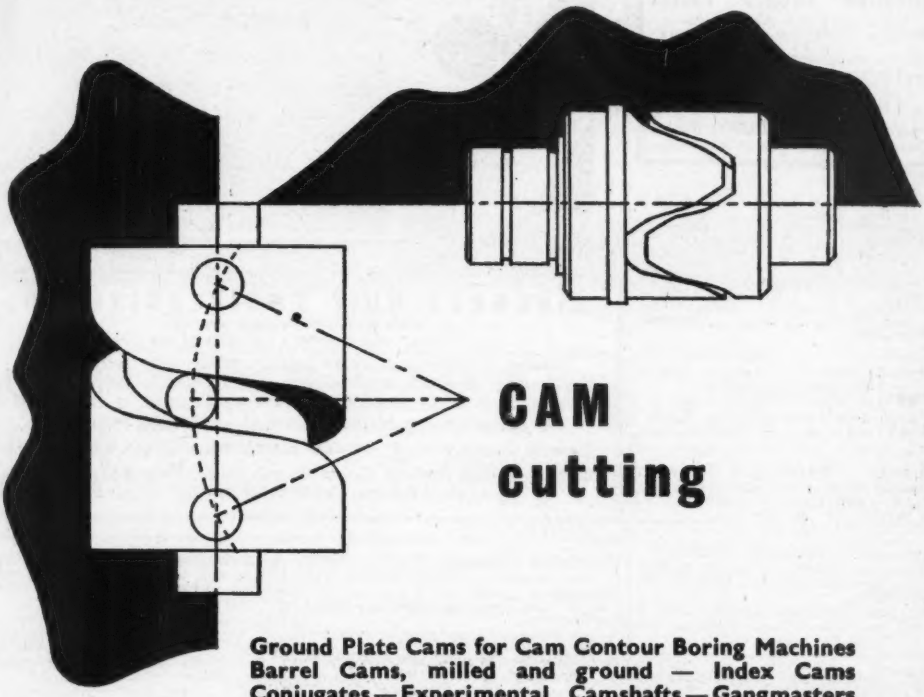

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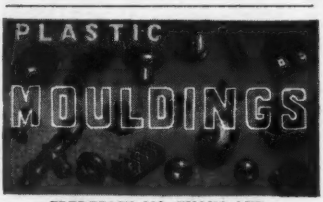

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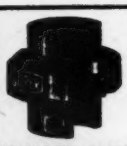

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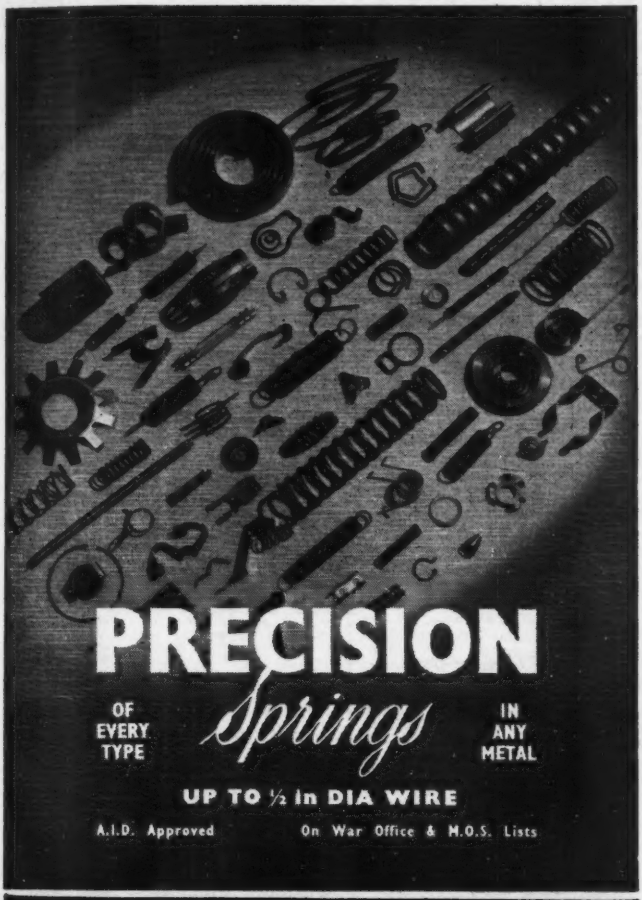

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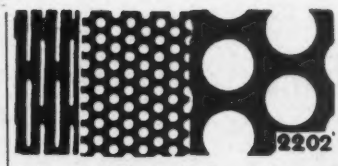

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New Process Type PW10 Portable Pliers—Type Spot Welding Machine for sale. For edge welding two thicknesses of 12 or 14 s.w.g. Stainless steel. 10 kVA, 200 volts, 50 cycles. Throat 2½in. Flexible leads 6ft. long. Overhead gantry to carry the head or it can be used free. Weld timer from 0 to 8 seconds. —Photo, etc., from F. J. EDWARDS LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham 3.

C.V.A. No. 1 Gear Hobber. Capacity 2in. dia. × ½in. face. Automatic cycle. With coolant equip. Motorised.—WILCOX & CO., Barr Street, Birmingham, 19. NORthern 1234/5.

18in. 'Rapidor - Manchester' Hacksaw, 3 h.p. Motor, Geared Suds Pump and Vice. Further details from:

C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.
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Cashmores

Selection of Machine Tools from Stock

CENTRE LATHES

MITCHELL OF KEIGHLEY 8½in. S.S. & S.C. Lathe to admit 4ft. 3in. between centres.
MITCHELL OF KEIGHLEY 10½in. S.S. & S.C. Lathe to admit 4ft. 0in. between centres.
VOLMAN 8in. S.S. & S.C. Gap Bed Lathe, to admit 4ft. 6in. between centres.

BORING MACHINES

WEBSTER & BENNETT 36in. Vertical Boring Mill, table speeds 5.6/125 r.p.m.
WEBSTER & BENNETT 48in. Vertical Boring Mill, table speeds 4-88 r.p.m.

DRILLING MACHINES

SWIFT 4ft. 6in. Model A1 Elevating Arm Radial Drilling Machine, No. 4 m.t. spindle, motorised 400-440/3/50 cycles.
New **KITCHEN-WALKER** 4ft. 6in. Radial Drilling Machine, No. 5 M.T. spindle.

GRINDING MACHINES

JONES & SHIPMAN Fig. 540 Horizontal Spindle Surface Grinding Machine, hydraulic feed 6in. × 18in. capacity.
One similar Machine with vertical spindle.
NORTON 6in. × 30in. Hydraulic Plain Cylindrical Grinding Machine, maximum wheel diameter 20in.

MILLING MACHINES

HYPERMILL 7/27 Production Type Milling Machine, 43in. × 10in. table.
MIDGLEY & SUTCLIFFE Hand Lever Feed Milling Machine, 16in. × 5in. table.
RICHMOND No. 4 Universal Milling Machine, 50in. × 12in. table with vertical milling and slotting attachments.
EDGWICK No. 2 Dial Type Plain Horizonta Milling Machine, 46in. × 11in. table.
ARCHDALE 20in. Dial Type Horizontal Milling Machine, 40in. × 12in. table.
GREENWOOD & BATLEY Plain Horizontal Milling Machine, working surface of table 20in. × 10in.
EDGWICK 18in. Horizontal Plain Production Milling Machine, with 40in. × 12in. table.

POWER HAMMER

MASSEY 5 cwt. Pneumatic Side Type Power Hammer.

SLOTTING MACHINES

BUTLER 14in. stroke All Geared Slotting Machine with 39in. diameter rotary table.
DUTRANNOIT 24in. stroke Precision Slotting Machine with swivelling head, 39½in. table.

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New **ALBA** 24in. and 18in. stroke Shaping Machines.
BUTLER 18in. Heavy Duty Shaping Machine.

SHEARING MACHINE

New **KEETONA** 8ft. 0in. × ¼in. Undercrank Guillotine Shearing Machine.

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BRONX 8ft. 0in. × ¼in. Straightening Rolls. 5 roll type.

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SMART & BROWN Internal Grinder. 1½in. Max.
NORTON 18in. × 7in. Hyd. Cyl. Grinder. £395.

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JOHNSTEAD 5ft. 6in. Facing Lathe.
MURAD ¾in. 3Q Capstan, full equip.
DARLING & SELLERS 10½in. × 12ft. T/T.
HASSE & WREDE 10in. × 42in.
OLDFIELD & SCHOFIELD 15in. × 60in. £650.
HERBERT SMALLPEICE, 6in. × 24in. Multi-tool.
RIVET Instrument Lathe, 4½in. × 24in.

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A KERSHAW Vert. Mill 18in. × 7in.
RICHMOND 0.1 Horizontal 30in. × 8in.
CENTEC No. 3R Auto-cycle, pro mill.
HEY Duplex Spline Mill. £175.
ADCOCK & SHIPLEY IVM Vert. 25in × 7in. As new.

POWER PRESSES AND SHEET METAL MACHINES

BLISS 250 ton Coining Press.
BLISS 21B 60 ton geared. Adj. Str.
BLISS 20B 20 ton Roll feed. Adj. Str
RHODES 30 ton geared, adj. str.
BESCO 20 ton.
WARD 20 ton.
TAYLOR & CHALLEN 10 ton.
SEDGWICK 12ft. × ⅛in. Folder.
BESCO 10 ton Power Press. £175.
E.M.G. 9-ton Airdraulic. £200.

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RAPIDOR 8in. × 8in. heavy duty power saw.
MANURHIN TR12-16 ¼in. Auto. 1958.
T.T. & H. Engraver CB with div. table.
MIDSAW 36in. Bandsaw.
BARBER & COLMAN 15in. Hobber.
THIEL Filing and Sawing Machine. £95.
HURTH Key Seating Machine. £225.
THIEL Punch Shaper.
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Bristol Compressor and Receiver 7 c.f.m. Two Mossberger Rolling Mills. Grossman vertical profile grinder. Two vertical C.I.H. Lathes. Gas annealing furnace. 10 kw. Conveyor Belt Furnace. Two electric pusher type furnaces.—Apply DENNISON WATCH CASE CO., 222, Soho Hill, Birmingham 19. NORthern 4545.

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B.S.A. ¾in. Automatic.
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BROWN & SHARPE 2G Automatic.
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HERBERT 4BS Capstan.
CHURCHILL No. 1 Planetary Grinder.
LANDIS 4in. by 18in. Plain Grinder.
B.S.A. Centreless No. 7 Grinder.
SCRIVENER ICA Centreless Grinder.
SMART & BROWN Internal Grinder.
PRECIMAX 6in. by 12in. Plain Grinder.
ORCUTT Spline Grinder.
TRIUMPH Centre Lathe.
LEBLOND No. 15 R.P. Lathe.
VAN NORMAN Plain Mill.
ADCOCK & SHIPLEY No. 3 Hor. Mill.
MILWAUKEE Simplex 12/24 Mill.
CINCINNATI Model 08 Vertical Mill.
AJAX 16in. by 4½in. Mill.
KELLER 1210 Diesinking Machine.
CINCINNATI Hydrotel 28in. Vert. Mill.
TOREY 12M 2 Sp. Profiler.
TAYLOR & CHALLEN 1½B Press.
KITCHEN & WADE No. 2 Honing Machine
SENTINEL 25T Power Press.
17in. **ALBA** Shaper.
AMMCO No. 6 Shaper. 6in. Stroke.
RUSHWORTH Guillotine. 3ft.
EDWARDS Sheet Metal Folder. 36in.
6 H.P. Column type 'H' Gear.

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GLEASON 12in. Str. Bevel Gear Generator.
FELLOWS 7125 High Speed Gear Shaper.
FELLOWS No. 72 High Speed Gear Shaper
FELLOWS No. 7 High Speed Gear Shaper.
FELLOWS 75A High Speed Gear Shaper.
FELLOWS 61A High Speed Gear Shaper.
HEALD 72A3 Internal Grinder.
GLEASON No. 16 Spiral Bevel Hypoid Gear Generator.

All machines motorised 400/3/50 unless otherwise stated.

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1 Edwards "Besco" 42in. Treadle Guillotine.
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2 Air Receivers, 150 p.s.i.
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1 Peco Chair Cramp, pneumatically operated.
1 Interwood Motorised Glue Mixer.
1 Smiths Hinge and Lock Recessing Machine.
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GRANOR OF HALIFAX 28in. stroke Heavy Duty Shaping Machine. 400-440/3/50.

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VICTORIA No. V2 Vertical Milling Machine. Table size 45in. × 11in. 400-440/3/50. Instant delivery.

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CAPSTAN LATHES

WARD No. 7 Chucking, covered bed.

MOREY 2G 1in. cap. with collet head and bar feed.

TURRET LATHES

WARD No. 16, covered bed, 8½in. spindle, 32in. 4-jaw chuck, rapid and power feeds to saddle, cross slide and turret, power rotating turret, spindle speeds 7-225 r.p.m., 50 h.p. motor.

WARD No. 10B, covered bed. 4½in. spindle power rotating turret, power and rapid feeds to turret only, collet head and bar feed.

DRILLING MACHINES

AVEY 2-spindle drill, pedestal base, ½in. capacity.

HORIZONTAL MILLERS

SUNSTRAND No. 2 Electro Mill, auto. cycle, 12in. by 54in. table.

HERBERT No. 3ND. Plain.

EDGWICK No. 2, 11in. by 42in. table, No. 40 steep taper.

JONES & SHIPMAN duplex slot miller. Hydraulic feed.

VERTICAL MILLERS

WADKIN high speed for light alloy, 16in. by 40in. table.

GRINDING MACHINES

B.S.A.-Landis, 6in. by 18in. plain hydraulic cylindrical grinder.

BROWN & SHARPE No. 2 Surface Grinder, 18in. by 6in.

TAPPING MACHINES

HERBERT No. 2 Flash Tapper, ¼in. capacity.

All machines motorised 400/3/50 unless otherwise stated.

GORTON 9J Copy Miller, 1942.
NEW BRITAIN GRIDLEY 61 1¼in. and 2½in. Six Spindle Autos, Late (4 available).
WICKMAN 1¼in. 5 Spindle Auto, late, 2 available.
B.S.A. ACME GRIDLEY ⅞in. 4 Spindle Autos., 3 available.
ACME GRIDLEY 2¼in. 4 Spindle Auto.
BARBER COLMAN Type D Gear Hobber.
WARD 7 Com. Turret Lathe.
INDEX OR 12 & 12 SS Autos.
EDGWICK Type A 1611 Diecaster.
SIDNEY 36in. swing × 144 Lathe.
REED PRENTICE 1½ G Diecaster.
GRIDLEY Type L 5in. Auto.
LE BLOND No. 2 Deep Hole Drill.
ELECTRAULIC VBH, 15 ton Broach.
BLANCHARD 18 Surf. Grinder.
VICTORIA U3 Monotrol-Univ. Miller, 1953.
CONOMATIC 8 sp. 1¼in. Bar Auto.
BROWN & WARD ⅝in. and 1¼in. Autos.
WARD 3A Capstans.
HERBERT 4 Senior Capstan.
CLEVELAND 1½in., 1¼in., 2in., 2½in., 3½in. Autos.
MASSEY 5 cwt. Press Hammer, 1942.
Three **UNION** ⅝in. Pedestal Drills. NEW.
BULLARD 16in. 6-sp. Mult-au-Matic, 1943.
GLEASON 12in. Bevel Gear Generator.
FELLOWS 61A, 645A Gear Shapers.
BRYANT 16-38 Internal Grinder.
HEENAN-FROUDE Baling Press, 1947.
SCHULER Vertical Dieing Press.
HERBERT 9S Turret Lathe.
MILWAUKEE 2H, 3K Plain Millers.
BLISS 304A 50 ton Press, 4in. stroke.
NORTON 14 × 72 Univ. Grinder.
BROWN & SHARPE No. 3 Univ. Grinder.
DEFIANCE 23A Horizontal Borer.
ARCHDALE 38in. Sens. Radial Drill.
NEWALL type L 10in. × 48in. Grinder, 1942
HEALD 72A Internal Grinders (3).
NORTON 12 × 36 Universal Grinder.
WARNER & SWASEY 3, 5 and 2A Turrets.
PRATT-WHITNEY 12B 2-sp. Profiler, 1941.
EDGWICK No. 2 Universal Miller.
CHURCHILL No. 1 Planetary Grinder.
ORCUTT HM24 Gear Grinder, 1944.
GISHOLT 5 and 1L Turret Lathes, 1941-43.
GRIDLEY Model R, 2¼in. cap. 4-sp. Auto.
ARCHDALE 18in. and 30in. Vert. Mill, 1942.
MONARCH Copying Lathe, 1946.
CHURCHILL PBH 12 × 36 Univ. Grinders.

All modern fully motorised machines.

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RYDERMATIC No. 12 Vertical Multi-Tool Lathe.

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FORST RIAS Universal Vertical Broach for internal and surface broaching, 5 tons, 39½in. stroke. 1952 machine.

GRINDERS

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JUNG AS Internal.
KEIGHLEY Type XL Hydraulic Plain Grinder, 6in. × 18in.
CHURCHILL 10in. × 24in. Universal.
LANDIS 12 × 48 Universal.
BROWN & SHARPE No. 3 Universal.
NORTON 14in. × 36in. Universal.
New BAMKIN Tool and Cutter.

CAPSTAN AND TURRET LATHES

LEICHTI PR Turret Lathe (Swiss).
GISHOLT IL Turret Lathes.
FOSTER No. 2B Turret Lathe.

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SMART & BROWN Type M 4in. Precision.
HENDEY 6in. × 30in. Taper Turning.
MONDIALE 7in. × 60in. Gap Bed.
WARD, HAGGAS & SMITH 8½in. Gap Bed, 36in. between centres.
CROMWELL 3½in. Precision.

MILLERS

WERNER No. 5160 Small Multipurpose, Vert. and Horiz. Table 22in. × 6½in.
ARCHDALE 14in. Manufacturing type.
CINCINNATI Type OK 18in. Horiz.
EDGWICK 18in. Horizontal.
ARCHDALE 20in. Twin Overarm Horizontal. Table 40in. × 10in.
KENT-OWENS 1-8 and 1-14 Hydraulic Production.
MILNES Sw. Hd. Vertical. Table 30in. × 8½in.
HERBERT 23V Vert. Table 68in. × 17in. 48in. traverse.
REED PRENTICE No. 6 Vertical. Table 84in. × 20in.
HELLER Automatic Thread Millers (4).
ASQUITH HKO Duplex Keyseater.

PRESS

V. & O. No. 11 Double Action. Approx. 10 tons. Roll feed. Max. draw 1in.

All machines motorised 400/3/50 unless otherwise stated.

Bullard Verticalauto, D-type, 8 spindle 16/23, double indexing. Complete with compound slides and chucks.—HENRY KIRK (MACHINE TOOLS), LTD., Yate, Bristol. Tel.: Chipping Sodbury 3081.

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Churchill HBB Internal Grinder with Sizematic Attachment.

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R. O. GRAY

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TWO **WARD** 3A Capstan Lathes. Both equipped ball chuck and bar feed.

DRUMMOND Model K Capstan Lathe, arranged for chucking. 2$\frac{1}{16}$in. Hollow spindle.

HERBERT No. 7 Junior Combination Turret Lathe. Flamard bed.

ONE **HERBERT** 2B Capstan Lathe, arranged for chucking.

HERBERT 1S Capstan Lathe, part bar feed.

TWO **MOREY** 2G Capstan Lathes, arranged for chucking.

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HERBERT 1$\frac{1}{4}$in. Single Spindle Bar Automatic, with equipment.

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PEARN-RICHARDS No. 2 Horizontal Boring and Facing Machine. With Vernier Height Gauge and Boring Bars.

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KITCHEN & WADE Heavy Duty Pillar Drill. Spindle bored No. 4 M.T. Rise and fall table 24in. dia., swings round column.

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DISKUS Vertical Spindle Surface Grinder, hydraulic feeds. Table 53in. by 10in. 14in. dia. segmental wheel.

CHURCHILL Model "O" Universal Tool and Cutter Grinder, capacity 8in. by 16in.

EDGWICK No. 1 Keyseating Machine.

DAVID BROWN Worm Shaft Milling Machine, 4in. centres by 33in. between centres.

BROWN & SHARPE No. 2 Universal Milling Machine. Table W.S. 46in. by 10in. Spindle speeds 30-1,300 r.p.m. With high speed Vertical Milling Attachment, Slotting Attachment, Universal Dividing Head, chuck, change gears, rotary table, etc.

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ARCHDALE 20in. Plain Horizontal Milling Machine. Table W.S. 10in. by 31in. Dial change.

EDGWICK 18in. Plain Horizontal Milling Machine. Table W.S. 26in. by 7in. Spindle speeds 30-600 r.p.m.

ASQUITH Two Spindle Profile Milling Machine. Capacity 24in. by 28in. Spindle speeds 250 to 3,000 r.p.m.

WOTAN 16in. Crank Shaping Machine.

ALBA 18in. Crank Shaping Machine.

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JONES & SHIPMAN "Electrotap", with quantity of leaders.

SIX TURNER Spin Rivetting Machines, type R.S.5.

CANNING Centreless Polishing Machine, with motorised dust extractor.

EDWARDS 4ft. by 14g Power Guillotine.

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PFAUTER R.S.1. type Vertical Gear Hobber.

PFAUTER R.S.11 Horizontal Gear Hobber.

All machines self-contained drive. 400/440 volts, 3 phase, 50 cycles.

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KEARNS OA Horizontal Borer. Travelling spindle 2½in. dia. Facing head 14in. dia. With verniers. M.D. 400/3/50.

MINIMUS Gear Hobber. Similar to Mikron 79. M.D. 400/3/50.

WICKMAN Grinding and Lapping Machine. Model 14C. Takes one grinding wheel 14in. by 2in. and lapping wheel 14in. by 2in. Two canting work tables 31in. by 19in. M.D. 400-440/3/50.

JONES & SHIPMAN Slot Hydromil. Built 1951. Will cut two keyways together up to 12in. by 1in. M.D. 420/3/50.

8½in. **LANG** S.S. & S.C. Lathe. Admits 48in. between centres. 12 speeds 19-900 r.p.m. M.D. 400/3/50.

VAN NORMAN Model 2LP Plain Horizontal Miller. Table 45in. by 10in. Long. power traverse 28in. Quick power all ways. 18 speeds 30-1,450 r.p.m. 420/3/50.

CINCINNATI No. 2 Dial Type Horizontal Miller. Speeds 20-500 r.p.m. Dual controls. Quick power all ways. M.D. 400/3/50.

PLANERS Ltd. Double Housing Planer. Cap. 8ft. by 2ft. 6in. by 2ft. 6in. approx. 2 toolboxes. M.D. 400/3/50.

HERBERT Type OV Vertical Miller. Table 24in. by 7in. Speeds to 2,000 r.p.m. Swivel head. M.D. 400/3/50.

BLISS No. 18 Inclinable Power Press. Tonnage rating 8. Fixed stroke 2in. Bed 15in. by 9½in. with 4½in hole. M.D. 400/3/50.

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C.V.A. Vertical Swivel Head Miller. Table working surface 19in. by 9½in. traverse 12in. by power or hand. 10 spindle speeds by V-cone pulleys. 3 rates of power feed to table. V-belt drive from 400/3/50 motor.

WARD 2A Capstan Lathe. Swing over bed 11½in.; swing over cross-slide 6½in. A.G.H. 6 speeds 71-1,531 r.p.m. Spindle bore 1⅛in. Power to turret. M.D. 400-440/3/50.

KEIGHLEY 12in. by 24in. Universal Grinder with internal attachment. Built 1951. M.D. 400/3/50.

FROST 8ft. by ¼in. Cramp Folding Machine. Length of blade 96½in. Top beam lifts 7in. by 2 H.P. motor. Top beam swings out for work removal. Bending beam adjustable for sharp or round bends. Drive by 7 H.P. main motor through gearings. M.D. 400/3/50.

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ASQUITH U.G.D. Vertical Drill. Spindle No. 5. M.T. 12 speeds 31-830 r.p.m. F. & R. Centre of spindle to back 15½in. Quick acting compound table with working surface 30in. by 10½in. M.D. 400-440/3/50.

EDGWICK Centring Machine. Single ended. Centre height 6½in. 3 spindle speeds by V-cone pulleys. M.D. 220-440/3/50.

H. BELL (Machine Tools) LTD., Walter Street, LEEDS 4.

Corona Heavy Duty Vertical Drilling machine. No. 5 Morse Taper Excellent condition.

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LANG 15in. crs. S.S. & S.C. Lathe on straight bed to admit 9ft. 2in. between centres, hollow spindle 2⅛in., spindle speeds 1.6-96 r.p.m. Norton type box.

CHURCHILL-REDMAN 18½in. centres S.S. & S.C. Lathe to admit 10ft. 0in. between centres, swing in gap 62in. × 19½in., hollow spindle 5⅞in., 8-253 r.p.m., Norton type box, 4-way toolpost, rapid traverse to saddle.

WARD Model No. 1A Capstan Lathe, hole in spindle 1¼in., spindle speeds 20-4, 310 r.p.m., swing over cross slide 6½in., over bed 10in.

CINCINNATI No. 3 Dial Type medium speed Universal Milling Machine, table size 62½in. × 15½in., spindle speeds 18-450 r.p.m.

NEWALL type L Hydraulic Plain Cylindrical Grinding Machine, 10in. × 36in. capacity, suds pump and piping.

OLDFIELD & SCHOFIELD 35in. swing, Surfacing and Boring Lathe on 10ft. 0in. bed, swing over cross slide 28in., dia. of hollow spindle 4½in., spindle speeds 6.5-332 r.p.m.

PFAUTER Model RS.9 Gear and Spline Hobbing Machine, max. hobbing length (tooth face) 19½in., max. dia. hobbed 10½in. max. pitch hobbed 2½in.

THOS W. WARD LTD.
ALBION WORKS · SHEFFIELD

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Bryant No. 24-36 Hydraulic Internal Grinder, complete with Hydraulic Wheel Dressing device, Spindle, etc.

Further details from:—
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Edwards

BESCO Double Geared Hand Operated Universal Folding Machine. Capacity 6ft. 2in. × ¼in. Folding beam adjustable for sharp and round bends. Adjustable stop for repetition bending and adjustable back gauge. Weight approx. 6496 lb.

BESCO Model 72/10 Production Guillotine. Motorised for 380-420/3/50 supply. Capacity mild steel 72in. × ¼in. Fitted with automatic hold-down and adjustable front, back and side gauges. Open ended side frames. Weight approx. 48 cwt.

FOUR **BLACKBURN & CRAWSHAW** Power Operated Geared Rotary Shearing Machines. Capacity ¼in. thick. Depth of gap 20½in. Cutters, dia. × thickness 5½in. × ¼in. Cutting speed 51ft. 6in. per minute. Arranged motor drive 400/3/50.

KEETONA Universal Folding Machine. Capacity 73in. × ¼in. With balance weight and adjustable stop for repetition bending. Max. lift of top beam 2½in. Max. radius with radius blades 1in. Weight approx. 46 cwt.

BRADLEY & CRAVEN Geared Press Brake. Motorised for 400-440/3/50 supply. Max. pressure approx. 65 tons. Forming capacity 10ft. × 12 s.w.g. over die opening of ⅜in., or 8ft. × ¼in. over die opening of 1¼in. Depth of gap 7¼in. Fitted with goat's foot top tools and bottom dies. Weight approx. 8½ tons.

TWO NEW **LEN** 40/250 Open Fronted Inclinable Power Presses. With adjustable stroke. Motorised for 400-440/3/50 supply. Pressure exerted 40 tons. Depth of throat 9½in. Adjustment of stroke ¼in. to 3⅛in. Table 18¾in. × 25⅜in. Hole in table 8½in. diameter. Weight approx. 58 cwt.

TWO NEW **LEN.** 25/220 High Speed Open Fronted Inclinable Power Presses. With adjustable stroke. Motorised for 400-440/3/50 supply. Pressure exerted 25 tons. Depth of throat 8⅜in. Table 16½in. × 22⅜in. Hole in table 8½in. Stroke adjustable from ¼in. to 3⅜in. Weight approx. 35 cwt.

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ARCHDALE 20in. Milling Machine, table size 40in. × 10in., power and rapid traverses to table, reversing spindle, backlash eliminator. 400/3/50.

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PITTLER 12mm. Swiss type.
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AE4 BECHLER 1 spindle attachment.
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⅞in. **B.S.A. ACME GRIDLEY** RA6 spindle. Screwing spindle, Collets and Tooling. 3 available. 1944-1948.
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1¼in. **CONOMATIC** 4-spindle.

CUTTING OFF MACHINES

BALLINGER Abrasive type C.
CLIFTON & BAIRD Cold Saw. 6in.

LATHES

BINNS & BERRY A.G.H. 10in. centres & 6ft. between 36in. in gap. Speeds 22-490.
CHURCHILL-REDMAN A.G.H./SS & SC. 9in. centres by 6ft. between Gap Bed.
DEAN SMITH & GRACE A.G.H./SS & SC. 9in. centres by 4ft. 6in. between.
PRATT & WHITNEY A.G.H. 6½in. by 30in.
TRIDENT Gap Bed Lathe. 6½in. by 60in.
WARD HAGGAS & SMITH faceplate Lathe. 57in. swing, 64in. in gap. Short bed with adjustable gap.

GEAR HOBBING MACHINES

PFAUTER type R00.
MIKRON type 79.
CLEVELAND 130D.

MILLING MACHINES

CINCINNATI 08 Vertical.
THIEL Model 58 Tool Room Mill.
WADKIN High Speed Vertical, Table 35in. × 13in.

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MATTERSON No. 11.
HANSON WITNEY 9in. by 4in.
WICKMAN Moulton.
ARCHDALE with 120 Hobs.
WANDERER.

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ESSEX Punch Shaper Microscope and equipment.
ROCKFORD 28in. Hydraulic Universal.
INVICTA 6M 24in.
ALBA 4S 18in.

SLOTTERS

BUTLER RAPID 8in. Tool Room Machine.
BUTLER PRECISION 4in.

CAPSTAN AND TURRET LATHES

WARD No. 7 Capstans.
WARD No. 7 Combination. Serial K.
HERBERT No. 4 & 4 B.S.
HERBERT No. 2S & IS and O.
HERBERT No. 13 Bar Turret.
GISHOLT No. 4 A.G.H. Capstan.
GISHOLT No. 3 A.G.H. Capstan (Collet).
GISHOLT No. 3 Simplified Capstan.
MODERN No. 1.
WARNER & SWASEY No. 1.
LIBBY 4R AGH Capstan.

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ARCHDALE Light Sensitive 36in. Rise and Fall Table. No. 3 Morse.

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All Electrics 400/3/50

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SNOW P.24, 24in. by 8in. Hydraulic.
DOALL 20in. by 6in. Hydraulic Feed.
JONES & SHIPMAN Fig. 540. 6in. by 18in.
BLANCHARD 10C. 16in. Mag. Rotary Table.

BROACHING MACHINES

LAPOINTE Vertical 8 tons. 36in. Stroke.
LAPOINTE Horizontal 15 tons. 50in. Stroke.
LAPOINTE Horizontal Twin Screw Stroke 40in.

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HERBERT J TYPE. Single Column and two column machines.
ARCHDALE Snout Type Electrically Controlled Vertical Borer. 50 Int. Taper.
LELAND GIFFORD 2 Spindle No. 2 Morse Taper.
ASQUITH Horizontal Duplex M/c. No. 5 Morse, 5ft. dia. Rotary table.

PRESSES

TAYLOR & CHALLEN 40 ton Variable stroke—Guards.
85-ton **RHODES** Upright Geared.
16-ton **RHODES** Inclinable.
25-ton **RHODES** Inclinable.
35-ton **RHODES** Inclinable.
50-ton **RHODES** Inclinable.
60-ton **TAYLOR & CHALLEN** B.3¼. Variable stop up to 4in., with Roll Feed and Chopper.
BLISS No. 8 Power Press.
FLY PRESSES, Nos. 3, 4, 5, 6.
FLY PRESSES Horning, No. 4.

GRINDERS—UNIVERSAL

JONES & SHIPMAN. 10in. by 27in.
LANDIS 12in. by 36in.
HENRI KAESER Model L. 10 by 20.

LAPPING MACHINES

HAHN & KOLB 26in. dia. with Coolant Filter Plant.
PETER WOLTERS Hydraulic. Two Spindle Vertical Honing Machine.

GRINDERS—CYLINDRICAL

PRECIMAX HUP. 1, 7in. by 10in.
PRECIMAX HUP. 1¼, 7in. by 12in.
PRECIMAX MPO., 6in. by 24in. Plunge.
CARL UNGER 12in. by 36in.
NORTON 10in. by 24in.
KEIGHLEY K Model 6 × 18.

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Newman

AUTOMATICS

BULLARD Multi-Au-Matic 7in. 6 spindle.
BULLARD Multi-Au-Matic 12in. 6 spindle.

BORING MACHINES

UNION Model BFT 100 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle (1955).
KEARNS Model OC Horizontal Boring Machine, 3in. dia. travelling spindle.
KEARNS No. 4 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle.
WEBSTER & BENNETT Vertical Boring Machine, table 50in. diameter.
RICHARDS Type PRT Horizontal Floor Boring Machine, 3½in. travelling spindle, 28in. diameter facing head.
GIDDINGS & LEWIS No. 45 Horizontal Boring Machine, 5in. diameter travelling spindle.

CAPSTAN AND CENTRE LATHES

CHURCHILL-REDMAN Model 13NM Heavy-Duty S.S. & S.C. Gap Bed Centre Lathe, 13in. centre height × 72in. between centres. Swing in gap 50 in.
MITCHELL Model DM10 S.S. & S.C. Gap Bed Centre Lathe, 10½in. centre height × 7ft. 5in. between centres. (NEW).
OLDFIELD & SCHOFIELD Surfacing and Boring Lathe, 10½in. centre height.
WARD 7B Combination Turret Lathe.
NILES Heavy Duty Centre Lathe, S.S. & S.C. 17in. centre height × 28ft. between centres.
U.L.R.O. Heavy Duty Centre Lathe, 16in. centre height × 30ft. between centres.

DRILLING MACHINES

HETTNER Radial Drilling Machine, 10ft. elevating arm.

GEAR MACHINES

ORCUTT Model HM24 Hydraulic Internal Gear Grinder.
GLEASON 3in. Straight Bevel Gear Generator.

GRINDING MACHINES

CRAVEN Roll Grinding Machine, capacity 20in. swing × 138in. between centres.
CHURCHILL Model HBY Internal Grinding Machine.
CHURCHILL Plain Cylindrical Grinding Machine, 26in. swing × 84in. between centres (1951).
LANDIS Type C Plain Hydraulic Cylindrical Grinding Machine, 6in. swing × 18in. between centres.
ORCUTT Model HM24 Internal Spur Gear Grinding Machines.
CHURCHILL Plain Hydraulic Cylindrical Grinding Machine, 20in. swing × 72in between centres.
BROWN & SHARPE Plain Cylindrical Grinding Machine, 10in. swing × 36in. between centres.

MILLING MACHINES

CINCINNATI No. 3 High Speed Dial Type Vertical Milling Machine (1950).
CINCINNATI Model 5/72 Plain Hydromatic Milling Machine, table 91in. × 22in. (1952).
CINCINNATI No. 2L Plain Horizontal Milling Machine, table 52in. × 10in.
CINCINNATI No. 1M Vertical Milling Machine.
CINCINNATI No. 4 Dial Type Horizontal Milling Machine.
PRATT & WHITNEY Model BL3620 3-spindle "Keller" Die Sinking Machine.
CENTEC Model 3E Automatic Production Milling Machine, table 25in. × 16in.

PLANING MACHINES

CANTONI Double Column Planing Machine, capacity 120in. × 48in. × 48in., two tool-boxes on cross slide. (1952.)

MISCELLANEOUS

LANGE & GAILEN 28in. stroke Double Headed Hydraulic Shaping Machine.
TAYLOR & CHALLEN Double Sided 50-ton Geared Power Press, 10in. stroke.

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Machine Tool Division : YATE, BRISTOL

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CHURCHILL 18in. by 72in. Plain Grinder.
LANDIS 12in. by 48in. Universal Grinder with internal spindle.
COVENTRY Matrix 21 Thread Grinder.
CHURCHILL 20in. by 84 Plain Grinder with throw blocks for crankshaft grinding.
TRIDENT 18in. by 6in. Surface Grinder.
JONES & SHIPMAN 4in. by 10in. Semi Universal Grinder.

CAPSTANS—LATHES—AUTOS

CONOMATIC 6 spindle 1¼in. Automatic.
WARD 2A Capstan. Bar and Chuck Machine.
LANG 10in. by 60in. S.S. & S.C. Straight Bed Centre Lathe.
HILLE 1¾in. Capstan, speeds to 1,200, feeds to turret and cross slide, hob and drag screwcutting.
SMART & BROWN ¼in. Capstan.
GISHOLT 3L Combination Turret Lathe, 4¼in. hollow spindle. 10 h.p. motor.

MILLERS

Two **STEINEL** Model SH4D Horizontal Milling Machines. 30in. by 8in. Table.
ADCOCK & SHIPLEY No. 3 Horizontal Miller, with vertical attachment. 50in. by 12in. Table speeds to 1,400.
DENBIGH C4 Plain Miller, with adapted motor drive.
RICHMOND MV1 Vertical Miller. Table 30in. by 10in. Speeds to 1,000.
ADCOCK & SHIPLEY 2V Vertical Miller. Table 36in. by 10in. Speeds to 1,500.
WICKMAN MOULTON ATM1 Thread Miller. Max. dia. milled 6in.

BORERS & DRILLS—TAPPERS

WEBSTER & BENNETT 36in. Hi-Power Vertical Borer.
ASQUITH 3½in. Floor Borer, spindle speeds 5.6-350. Screw cutting 3-12 t.p.i.
PROGRESS 4E Pillar Drill.
PEARN RICHARDS Horizontal Borer, 28in. dia. facing head, rapid traverses and screwcutting.
HULLER UG3 Radial Arm Tapper.

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LANG 7in. High Speed Finishing Lathe. £450
MYFORD DRUMMOND 3½in. Centre Lathe. £35
SMART & BROWN 4in. Centre Lathe. £110
WARD 7 Capstan, 2in. bore. £525

DRILLING MACHINES

ADCOCK & SHIPLEY Pillar Drill, No. 2 Morse. £65
SMITH & COVENTRY Pillar Drill, No. 2 Morse. £40

FOLDING AND BENDING MACHINES

COBURN 6ft. × 18 gauge Folding Machine. £90
BESCO 3½ft. × 18 gauge Folding Machine £45
HILMOR Tube Bending Machine, Model DB1. £45

GRINDING MACHINES

ABWOOD Surface Grinding Machine (hand feeds). Model TH2AP £375
CINCINNATI Plain Cylindrical Grinding Machine, 6in. × 24in. capacity. £450
EXCEL No. 1 Bench Surface Grinding Machine. £85
JONES & SHIPMAN Universal Cylindrical Grinder. £750

MILLING MACHINES

BEAVER Model A Turret Mill, 28in. × 6in. table. (As New.) £335
CINCINNATI No. 3 Sliding Head Vertical. Dial selection, 63in. × 15in. table. £750
CINCINNATI No. 3 Sliding Head Vertical, 55in. × 13½in. table. £350
VICTORIA V2 Swivel Head Vertical, 45in. × 11in. new table. £900
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MILWAUKEE No. 2 Horizontal, 50in. × 14in. table. £475
PARKSON 2P Horizontal, 52in. × 12in. table. £550

PRESSES

Fly Press No. 3, **NORTON**. £27
Fly Press No. 4, **VIZOR**. £27 10s.
Double Column Fly Press, screw dia. 2½in. £70
BESCO Bench Power Press (unmotorised), 4 tons. £40

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RYDER Verticalauto, capacity 16in. swing × 8in., 6 spindles.

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CRAVEN 5ft. and 6ft. Vertical Boring Mills, each fitted with two heads on the cross slide, one head fitted for Taper Turning. 400/3/50.

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JONES 6in. Spindle Horizontal Borer. Table 17ft. 6in. × 8ft. Spindle travel 48in. Rapid traverse 84in. per min. Motorised 400/3/50. Weight 70 tons.

BULLARD 36in. Vertical Boring Mill.

KITCHEN & WADE Vertical Fine Boring Machine, 14in. stroke, Compound table.

DRILLING MACHINE

ARCHDALE 8-Spindle Hydraulic Vertical Drilling Machine.

GRINDING MACHINE

HEALD No. 172 Gap Bed Internal Grinding Machine, maximum diameter of component 36in.

LATHES

NOBLE & LUND Heavy Duty Centre Lathe, 22in. centre height × 29ft. between centres. Max. swing over saddle 33in. dia.

HARVEY Heavy Duty Centre Lathe, 42½in. centre height × 52ft. between centres. Max. swing over saddles 65in. dia.

MILLING MACHINE

COLLET & ENGLEHARDT Keller Type Die Sinking Machine. Model FKf80, capacity 60in. × 30in.

PLANING MACHINES

CLEVELAND Openside Planing Machine capacity 10ft. × 2ft. 6in.

CINCINNATI Planing Machine, capacity 8ft. × 2ft. 6in.

MISCELLANEOUS MACHINES

Hydraulic Vertical Internal Honing Machine (manufactured by **PETER WOLTERS**), Capacity 0.2in. to 2in.

RAPIDAN Double Helical Gear Generating Machine, 12in. diameter capacity.

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PADDON MK3 type WP Cylinder Re-boring Machines.

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BOLEY-LEINEN Model ER15 ¾in. Capstan (modern).
HERBERT No. 2 Pre-optive Bar Turret Lathe, Flamard bed, 2in. capacity with bar feed, full turret tooling.
HERBERT Model 22A Turret Lathe. 8¼in. S.P. Hole.
LIBBY 2H 8in. spindle Turret Lathe.
MURAD Model 3Q ¾in. Capstan Lathe.

CENTRE LATHES

CROWTHORNE 10¼in. Lathe.
SOUTHBEND 7in. Centre Lathe.

GRINDING MACHINES

CAPCO No. 2 Horizontal Surface Grinder.
VICO (Swiss) Hydraulic Toolroom Universal Grinder 10in. by 30in.
LAMBERT Model 73 Watchmaker's Cutter Grinder (two)
CRAVEN Heavy Duty Roll Grinding Machine with capacity for rolls 42in. dia. by 12ft. between centres and fitted with automatic cambering. Will take rolls up to 25 tons weight. Fully motorised machine of modern design. WEIGHT 25 tons.
CRAVEN Heavy Duty Railway Wheel Lathe Swing 6ft. by 12ft. V-belt drive, 9ft. face plate lathe, fitted chuck jaws, weight 25 tons.
WALDRICH SIEGEN Roll Grinder. 36in. by 13ft. between centres.
Two **CINCINNATI** No. 2 Tool and Cutter Grinding Machines.
COVEL No. 2 Tool and Cutter Grinding Machine.
IMPERIA Tool and Cutter Grinder, Model M6 AR.
MATRIX No. 16G Plain Straight Thread Grinder.
MATRIX No. 6 Internal Thread Grinders, 3in. by 10in.
HEALD Model 81 Sizematic Internal Grinder.
WOLTERS Model I.L.1 Hydraulic Internal Lapping Machine.
PETEWE Model 3D Profile Grinding Machine. (Nearly new.)

TATE

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NASSOVIA Model V.11 Hydraulic Diesinker. Mould capacity 27½in. by 19¼in. by 23in. height. (Unused.)
VICTORIA Duplomatic Hydraulic Copy Milling Machine, 8in. by 8in. (NEW).

DRILLING MACHINES

PACERA ½in. Bench Drill (New).
Two **ARCHDALE** 36in. Radial Drilling Machines. No. 4 M.T.
Two **CORONA** Model 31A Heavy Duty Pillar Drills. 15 HP Motors.
CRAFTSMAN ½in. Bench Drills; four at £25 each.
Various **ACIERA** Precision Bench Drills.

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BESCO 42in. by 10 s.w.g. Power Guillotine.
HANDS 4ft. by ¼in. Guillotine.
RHODES 6ft. by ¼in. Guillotine.

MILLING MACHINES

FRITZ WERNER No. 3230 Precision Vertical Milling Machine, 24in. by 8in. table, longitudinal and cross power feed to table.
EDGWICK No. 1 Horizontal Milling Machine, 40in. by 10in. table.
DENBIGH Model No. C4 Horizontal Milling Machines.
VICTORIA Junior Mill (new).
SANT ANDREA Model U.F.O/5 Extra heavy duty Horizontal Miller. 86¼in. by 19in. Table travel 67in.
VICTORIA U3 Universal Mill.
VICTORIA Junior Omnimil (New).
Two **ARCHDALE** 18in. Automatic Cycle Kneeless Production Millers.
VICTORIA Model V2 Vertical Mill (Nearly new).
CUNLIFFE & CROOM No. 2 Vertical Mill (dial).
ARCHDALE 34in. Plain Horizontal Miller (nearly new).

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STIRK 16ft. by 5ft. by 5ft. double column Planers, four toolboxes; modern machines with Lancashire drive (Two).
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F. J. Edwards Ltd

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CHURCHILL 15in. Rotary Piston Ring and Surface Grinder.
GRAND RAPIDS No. 25 Hydraulic Spindle Surface Grinder, 18in. × 6in. table, 20in. table traverse
NORTON 6in. × 10in. × 36in. Hydraulic Open-side Surface Grinder.
HEALD No. 72 Sizematic Duplex Hydraulic Internal Grinder for finish grinding opposite holes.
SMART & BROWN 1½in cap. Internal Grinder.
BRYANT 16-38A Hydraulic Internal Grinder.
CHURCHILL Model HBB automatic sizing traverse feed type internal Grinding Machine with spindles for combined hole and face grinding, max. swing 19in
PRATT & WHITNEY 36in. × 12in. Vertical Spindle Surface Grinder.
JACKMAN No. 28, 53in. Disc Grinder.
HUNT No. 3 Twist Drill Grinder, 3in. cap.
HUNT No. 1 Twist Drill Grinder, ½in. cap.
BANDFACERS 43in. × 6in., and 36in. × 4in. (New.)

KEY SEATERS

EDGWICK No. 1 Vertical Automatic Key Seating Machine; capacity ¾in. × 20in.

MILLING MACHINES

CINCINNATI 0.8 Vertical Miller, 20in. × 6in.; 150-1,300 r.p.m.
ADCOCK & SHIPLEY No. 2 VP Vertical Production Milling Machine, table 30in. × 10in., capacity 22in. × 8in. × 18in., speed 750-1,500 r.p.m.
REED PRENTICE No. 2 V.G. Vertical Miller; table 20in. × 9in.; capacity 16in. × 11in. × 15in.
ARCHDALE 12in. light type high speed Vertical Milling Machine table 17in. × 10in., 12in traverse, speed 235-1,500 r.p.m.
B.C.A. Precision Vertical Milling, Boring and Drilling Machine, 8in. dia. table.
HERBERT 46V Vertical Milling Machine; capacity 36in. × 13½in. × 22½in.; table 58in. × 15in.; power rapid all ways.
CURD NUBE 2-spindle Vertical Profile Miller; table 17½in. × 14½in.
MILWAUKEE 2K Universal Miller; table 56in. × 12in.; capacity 28in. × 10in. × 17in.; 15-1,500 r.p.m.
CINCINNATI No. 2 dial type Universal Miller, table 49in. × 12in.; capacity 28in. × 10in. × 18in.; 500 r.p.m.
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VICTORIA U.2 Universal Milling Machine, table 45in. × 11in. with vertical milling attachment, slotting attachment and rotary table.
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Classified Advertisements (*PLANT FOR SALE, contd.*)

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26in. × 16ft. **BETTS BRIDGEFORD** (Consolidated) S.S. & S.C. Lathe, 26in. size, V-belt motor drive, North type gear box, 2 saddles with compound tool slides and geared taper turning attachment, push button control, height of centres 13in.; swing over carriage 17½in.; 9 spindle speeds from 7 to 133 r.p.m.; H.p. motor 15.

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32in. × 26ft. **LANG** Heavy Duty S.S. & S.C. Lathe, V-belt motor drive, Norton type gearbox, 2 saddles with swivel compound slides and geared taper turning attachments, push button control on headstock and each saddle. Height of centres 16in.; swing over saddle 23in.; 12 spindle speeds from 2-100 r.p.m. (can be increased); H.p. motor 25.

36in. × 7ft. 6in. **LANG** Heavy Duty S.S. & S.C. Lathe, V-belt motor drive, Norton type gearbox, one saddle, height of centres 18in.; swing over saddle 25in.; 6 spindle speeds from 10.25 to 60 r.p.m. (can be increased); H.p. motor 20.

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Most of the above machines are ready for delivery.

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11 a.m.

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SITUATIONS VACANT

If you do not wish your reply to any Box No. advertisement in this section to be forwarded to certain firms, please advise us. Your reply will then be destroyed, but you will not be notified as this would disclose the identity of the advertiser.

THERMIONIC PRODUCTS (ELECTRONICS) LIMITED
Shore Road, Hythe, Southampton.
Tel: Hythe 3265

A vacancy exists in our Production Machine Shop (currently engaged in small batch work) for an experienced Foreman.
The selected candidate must be able to achieve mutually agreed production targets in the following classes of work: Centre Lathe Turning; Capstan Turning; Surface Grinding; Vertical and Horizontal Milling; Sheet Metal; Bench Fitting; Instrument Assembly. It is not expected that sufficient experience will have been gained for this position if the applicant's age is less than 35 years. There is a canteen available; we work a five-day week, and a Sports and Social Club is in existence. It is envisaged that the selected applicant would enjoy staff conditions and eventually a salary of up to £1,000 per annum.
Apply in first instance to Production Manager.

Heat Treatment Processing Inspector. This is a new position in a large light engineering organisation in the North London area. Will interest a young man with an understanding of modern heat treatment methods and material testing. Duties will include the testing for hardness (using Rockwell and Vickers testing machines). Measurements of casing depth and micro structure of material, checking loading and unloading of furnaces, recording details of treatment for investigation and ensuring that treatments being carried out are as per specification.—Detailed applications for this weekly staff position should be made in writing to the PERSONNEL MANAGER, SIMMS MOTOR UNITS LTD., Oak Lane, East Finchley, N.2.

Work Study Engineer; Required by company situated in South Birmingham area manufacturing precision components; a sound knowledge of machining and work study techniques necessary. The position is a senior appointment with excellent prospects for advancement.—Please reply stating age and experience to BOX D106, MACHINERY, Clifton House, Euston Road, N.W.1.

Automatics Expert Required for sale and service of Continental precision machine tools from London. Experience with tooling design and layout for Swiss-type autos essential. Must have personality to advise clients. Interesting, well-paid post for someone who likes mixture of inside and outside work.—BOX C957, MACHINERY, Clifton House, Euston Road, N.W.1.

Foreman Required for Small factory S.W. London. Progressively minded young Engineer who should have served a good apprenticeship including toolroom and drawing office training. Experience of thread grinding an advantage. Able to control small labour force. Non-contributory pension scheme. —Apply giving details of age, education, apprenticeship, experience, to BOX D74, MACHINERY, Clifton House, Euston Road, N.W.1.

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Sandvik Swedish Steels Limited,
Manor Lane, HALESOWEN, Birmingham.

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Applicants must have at least five years experience in a supervisory capacity on inspection and be fully knowledgeable on metrology, quality control and inspection procedures generally. Previous knowledge of A.I.D. procedures essential.

This is a progressive position for a man of not more than 40 years of age who may, if suitable, progress to the position of Chief Inspector.

Apply giving past experience and salary required to

BOX D89, MACHINERY,
Clifton House, Euston Road, N.W.1

PRODUCTION ENGINEERS

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GEAR DIVISIONS

intend to set up a team of production engineers who will be responsible for investigating the effectiveness of existing operations and to consider the potential of new projects. They will be given professional accounting assistance as necessary. Applications are invited from Production Engineers who have experience of this type of work in the field of mechanical engineering. Preference will be given to those who hold a recognised professional qualification and to those who have experience in the field of mechanical power transmission.
One of those appointed will be selected to lead the team. Attractive salaries will be offered to suitable men. There are excellent promotion prospects.

Full details of age, experience, posts held and salary expected should be addressed to:—

Chief Personnel Superintendent
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Classified Advertisements (*SITUATIONS VACANT, contd.*)

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required by

LONDON SALES ORGANIZATION FOR AUTOMATIC TURRET LATHES

to initiate and develop a tool drawing office. Applicants should have served engineering apprenticeship, have extensive experience small tool design, estimating experience of contract drawing office work and be capable of controlling D.O. staff. Experience of estimating tool manufacturing costs and knowledge of toolroom organisation will be decided advantage.

This is an attractive opportunity for an engineer with personality, drive and the necessary qualifications, and the vacancy carries good salary with excellent prospects.

Write giving full details, experience, qualifications, etc. to

BOX D.111, MACHINERY, Clifton House, Euston Road, N.W.1.

AN OPPORTUNITY TO TEACH TECHNICAL SUBJECTS IN SECONDARY SCHOOLS.

The London County Council will be pleased to consider applications for salaried appointments in its teaching service from men wishing to teach woodwork, metalwork, technical drawing or engineering subjects. To meet in particular the needs of men in industry with no teacher training and little or no teaching experience a full-time residential course (two weeks commencing on 4th September 1961, and a further week in December), has been arranged at Shoreditch Training College, Coopers Hill, Egham, Surrey. Accepted candidates for appointment will be paid from the beginning of the course. Burnham Scale (£558-£1051 including London allowance)—commencing salary will depend on qualifications and experience. Qualifications needed are Higher National Diploma with at least two years' industrial experience or Higher National Certificate or an appropriate Full Technological Certificate of City and Guilds of London Institute with at least five years' experience. The cost of board and lodging for the course is expected to be £18, half of which will be refunded together with reasonable travelling expenses, on satisfactory completion of the course. For further particulars and application form send a stamped addressed foolscap envelope to EDUCATION OFFICER (TS.1/M/1983/7), County Hall, Westminster Bridge, S.E.1, immediately.

Foreman Required for Small Machine Shop North London.—Apply BOX D109, MACHINERY, Clifton House, Euston Road, N.W.1.

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Extrusion Engineers. American company requires senior engineers with experience of impact extrusion and related subjects.—First class men with technological and production experience are invited to apply in the first instance to HARMSWORTH, TOWNLEY & CO., Jordan Street, Manchester 15.

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Dept. 'SM', W. J. Meddings Ltd., Ipswich Road, Trading Estate, Slough, Bucks.

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INDEX TO ADVERTISERS

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INDEX TO ADVERTISERS—*(continued from page 185)*

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